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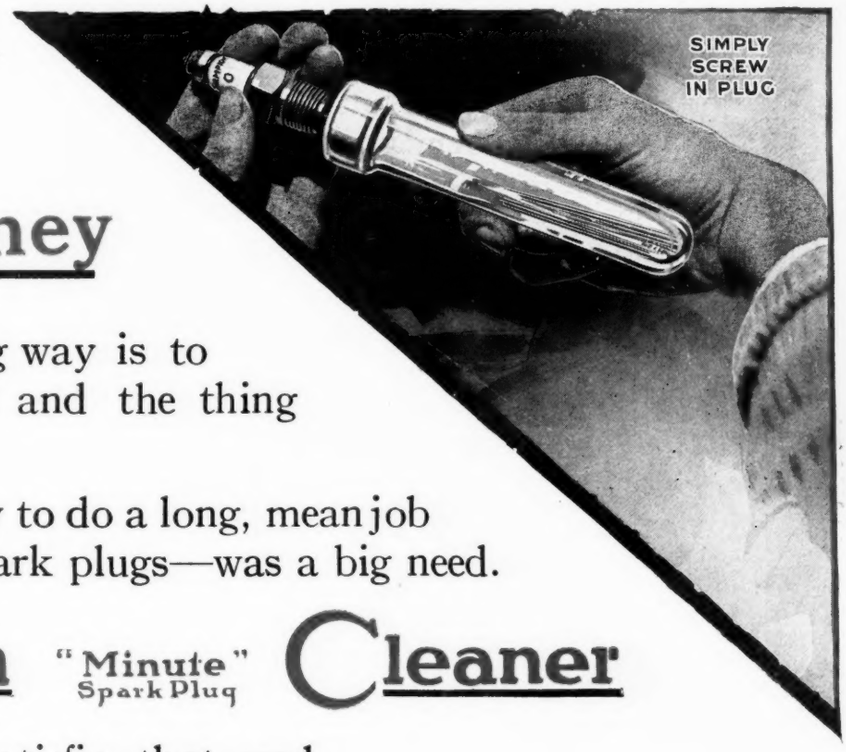


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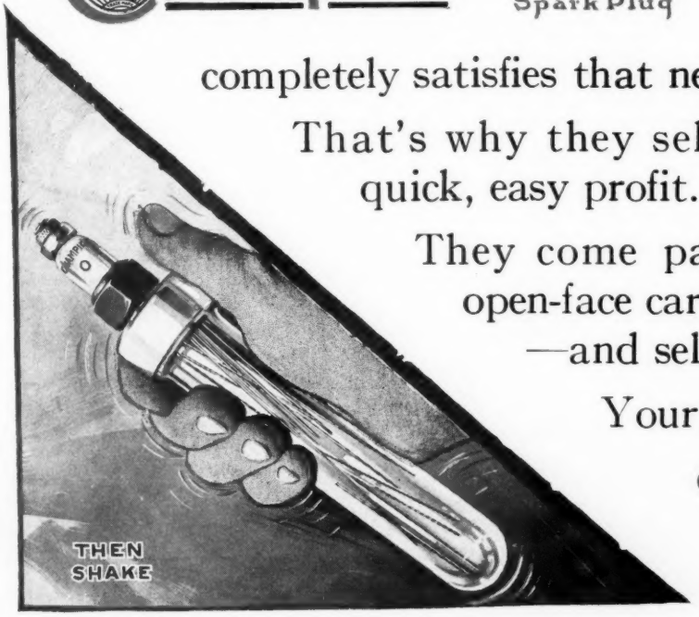


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Editorial Contents, page 3

Advertisers' Index—Next to last page

# Stop those Leaks

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, APRIL 11, 1918—CHICAGO NO. 15

# Score Authorities For Misleading Public Regarding Airplane Program

## Senate Committee Report Blames Delay on Ignorance and Lack of Centralized Authority—Urges One-Man Control—Minority Report Calls Progress Satisfactory and Praiseworthy

WASHINGTON, April 10—The Senate Military Affairs Committee which has been investigating the aviation program, to-day made public the results of its findings. The report deeply scores the administration for having "misled the public," and offers as its opinion that the principal causes of delay have been the lack of centralized authority with power to make quick decisions and "ignorance of the art and failure to organize effort."

In consequence, the committee recommends that production be taken entirely out of the hands of the Signal Corps and controlled completely by one executive officer.

Although the general tone of the report is optimistic, it does not reveal much that has not already been made public, and except in a few places it does not tear away from the aviation program that veil of secrecy and mystery which has been so apparent and which has been so productive of derogatory rumors.

The report was not unanimous. It was adopted by the narrow margin of 8 to 6, after what is reported as a furious debate. After the adoption of the report Senator Sheppard of Texas was given leave to file a minority report, which, if anything, is more important than the majority report.

This minority report "does not believe that the report of the majority bears a proper estimate of what is being accomplished or that it is sufficiently complete to give an accurate estimate of the facts."

Following the publication of the reports, it is intimated that the committee headed by H. Snowden Marshall and appointed by President Wilson to investigate airplane activities, will recommend a department of aeronautics to control all airplane production. Mr. Marshall and his committee have been working day and night upon the report and will submit their findings to President Wilson Friday. It is not known yet whether the committee will stand behind the presentation and ask the President for a conference on the recommendation which is to form a separate department.

Heretofore President Wilson has not been enthusiastic over the establishment of such a department. But it is now believed that in the light of the present airplane condition, the President will consider this new department more favorably.

A report has it that E. R. Stettinius, formerly Surveyor of Purchases and just appointed Second As-

sistant Secretary of War, may be placed at the head of the reorganized department. Other reports are that Howard E. Coffin will head the new organization. It is regarded as certain that production will be absolutely divorced from any interference by the Signal Corps. Rumors that Howard Coffin will be made head are met with positive denial from high officials. In fact, it is stated that he will be used in a bigger and more valuable way. Mr. Coffin has been active only in an advisory capacity and his plans which have been submitted to the Signal Corps have been changed frequently. It was stated that under the new scheme Mr. Coffin will be given more authority and wider initiative.

Official data filed with the report show that the Gnome, Le Rhone and Hispana-Suiza engines, all foreign but being manufactured in America, are being used for advanced training planes and 965 have been manufactured. Five types of combat planes have been adopted at different times. Two were abandoned and three are now on the program. They include the Handley-Page, to carry six men, eight machine guns and a very heavy load of bombs, and to be driven by two Liberty engines; the DeHaviland, to carry two men, four machine guns, and a moderate bomb load, to be driven by one Liberty engine.

Fifteen of these have been finished and one of them is in France. The third machine is the Bristol, which is the lightest and fastest and expected to make 125 m.p.h. It will be used as a reconnoissance machine and will carry two men, one machine gun, and will be driven by one Liberty engine. The first Bristol machine was finished the last week of March, 1918. The committee in its report stated that it knew the full number of machines ordered in this country and abroad, but that it would be best not to make it public.

# Report of the Senate Military Affairs Committee

"IN spite of the unanimous testimony of motor experts along this line," says the report, "government officials having charge of the manufacture of the Liberty engine have made the mistake of leading the public and the allied nations in the belief that many thousands of these motors would be completed in the spring of 1918.

"Information of this sort is not borne out by the facts, has been injurious, and its constant dissemination the committee regards as detrimental to our cause. It is greatly to be regretted that the statements of government officials have misrepresented the progress of the aviation program. This has misled the public, and your committee, cognizant of the facts, has in the performance of its duty made this report to the Senate.

### One Executive for Aircraft Production

"The committee believes that production of aircraft should be controlled by one executive officer appointed by the President and responsible to him. He should be assisted by a corps of the best aircraft engineers and designers possible to obtain, both European and American. The matter of production should be taken out of the hands of the Signal Corps entirely, and no man who has any remote interest in a company manufacturing airplanes or engines should be permitted to act as advisor or to be an authority.

"While we are developing American aircraft and American engines, we should temporarily at least secure an abundant supply of proved types of aircraft and engine of European design. However, it seems to the committee that every encouragement should be given to the development of aircraft and that any action which retards our progress, such as trust agreements or the prevention of those developing machines for flying under proper restrictions should be removed.

"The committee also believes it to be its duty to point out that no broad plans looking to future development have been laid down by the authorities. Warfare in the air is still in its infancy, and as it is natural that rapid changes will take place in both engines and planes, it is essential to our success that those in charge of American aviation development should be constantly looking ahead and devising plans for a continued extension of the program as well as the development of new types of engines and planes.

"Your committee being devoid of technical knowledge of motors and airplanes does not attempt to point out in detail engineering or manufacturing errors which have been committed and which in part may account for this gravely disappointing situation. Your committee, however, is convinced that much of the delay in producing complete combat airplanes is due to ignorance of the art and to failure to organize effort in such a way as to centralize authority and bring about quick decisions.

"The certain aloofness in dealing with persons possessing information based upon experience and apparent intention of confining the production to a restricted number of concerns and the failure of the officials in charge of the work to grasp the situation in a proper way and concentrate upon the best proved foreign engines and planes and proceed to build as many as possible for the campaign of 1918 has contributed to the failure.

"It is greatly to be regretted that the statements of government officials have misrepresented the progress of the aviation program."

The committee pointed out certain facts in the report taken from the testimony of Major General George A. Squires, Chief Signal Corps Officer, and Col. E. A. Deeds of the Signal Corps:

"It is apparent from this evidence," said the committee, "that the 12-cylinder Liberty engine is just emerging from the development or experimental stage. Since the original design and the setting up of the first completed motor in July, 1917, a large number of changes have been found necessary.

### Important Changes Made in Motor

"Within the last two months changes of considerable importance have been made which it is hoped will make the motor serviceable for combat planes of the defensive type and for mounting on observation planes. It is not designed for and cannot be used in the swift single-seater flying machines. A few of the motors are being placed in proper machines.

"These reports as recited to the committee indicate that with the later changes the motor will be satisfactory for the character of work expected of it and that it bids fair to hold its own with foreign motors of similar power, weight and purpose.

"For the campaign of 1919 the Liberty engine must undoubtedly be further improved in order to keep up with the evolution constantly going on along the front.

"Twenty-two thousand, five hundred Liberty engines have been ordered, 122 have been completed for the army and 142 for the navy; four have been shipped overseas. Some of these, already delivered, are being altered to overcome the defects ascertained during the last few weeks. It is understood, however, that these alterations will consume but a very short time.

"The production of combat planes in the United States for use in aircraft warfare has thus far been a substantial failure and constitutes a less serious disappointment of our war preparations. The history of the negotiations for the adoption and manufacture of this plane affords a disagreeable illustration of procrastination and indecision too long to recite. Suffice it to say that the designs and specifications of this plane which has been used with marked success by the British and placed in production by that government were offered to our officials as early as May, 1917.

"The testimony before your committee shows that the Signal Corps finally decided upon the manufacture of a number of sets of parts of this machine about Jan. 1, 1918. Eventually the finished parts will be shipped to England, where they are finally to be assembled in factories now being prepared for this work.

"Officials in the Aviation Section of the Signal Corps testify that they do not expect the completion of the first set of parts in this country before June, 1918. Twenty aviation training schools with a capacity of 3000 cadets have been established; four more are being constructed.

"The Signal Corps dispatched some 1200 cadets to England, France and Italy last year, who were to receive primary and advanced training in aviation schools of these countries. Serious delay has occurred in providing them with the training planes. As a result several hundred of the American cadets have been practically idle and have made no progress. About 450 of them are reported as having completed the primary training. The Signal Corps is giving serious consideration to the advisability of bringing them back to the United States to be trained.

"Otherwise the primary training of our aviators appears to be progressing favorably. The health record of the schools is excellent and the fatalities arising from aviation accidents, while always distressing, appear to be less frequent than in the schools of our allies. On April 1 primary training planes to the number of 3458 had been completed and advanced training planes numbering 342 had been turned out."

## Minority Report of the Senate Military Affairs Committee

FOLLOWING is the Minority Report on the aviation situation given out by Senators Morris Sheppard, H. L. Meyers, and W. L. Kirby:

"We do not believe that the report of the Majority of the Senate Military Affairs Committee on the aviation situation bears a proper estimate of what is being accomplished or that it is sufficiently complete to give an accurate impression of the facts.

### Machines Ordered in France

"Soon after the war began, the Signal Corps arranged with the French government for the making of 6100 combat planes at a total cost of $127,000,000, the planes to be produced as rapidly as American flyers could be trained to operate them. As the American Aero Squadron reaches the front ready for duty, battle planes are being supplied them under this arrangement.

"To aid in this foreign manufacture of planes for American flyers, the Signal Corps has been supplying 11,000 tons of various materials and has sent 7000 mechanics to release, from French factories making planes for our American flyers, the French worker on motor transports. The Signal Corps then arranged for the making of about 11,000 combat planes in the United States, the term 'combat plane' being used to designate all kinds of planes both offensive and defensive except training planes.

"The Curtiss Airplane Corp., the Dayton Wright Airplane Co., the Fischer Body Co., the Standard Aero Corp., the Grand Rapids Airplane Co., Mullen & Co. and about nineteen other companies throughout the country are engaged either in the production of complete planes or of spare parts.

"Let it be said here that when the war began, the United States Government had purchased altogether less than 200 airplanes in its entire history and that of the few airplane factories in this country, probably not one was making over five or six a month.

"It is hardly possible to grasp the magnitude of the task the factories, contracting to make the 11,500 combat planes, found before them. New plants had to be constructed, old ones fundamentally changed, special tools for the making of the planes had to be devised and manufactured and mechanics had to be trained to make the tools and also to make the planes after the tools had been completed.

"An airplane, especially the battle plane, is one of the most highly technical, delicate and complicated machines known to man. In no other form of machinery is absolute and painstaking accuracy in the smallest detail more indispensable. It has about 4000 parts that require from 1800 to 2800 different drawings in the preparation for its manufacture, almost as many drawings as are required for a battleship. Every part is strained to the utmost while the machine is in the air and the slightest break almost anywhere means instant disaster.

"When it is remembered how often the wheels of railway trains, due to hot boxes and so forth, parts of railway and automobile engines, tires on automobiles and so forth fail, necessitating immediate repair and that any similar breakdown in an airplane would mean, as a rule, death to its occupants, some part of the responsibility and difficulty involved in making a finished plane may be understood.

"Remember further that every fighting plane must have machine guns, synchronizing devices, special telescope airplane sights, wireless apparatus, cameras of special type, electric heating devices for clothing, oxygen apparatus, altometers, speed indicators, special gages, chronometers, compasses and so forth.

"To say that this complicated equipment is in steady and adequate production and that the factories are now about in shape for quantity production of combat planes and have about completed the foundations of what is as difficult and responsible a task as has ever fallen to the brain of man is to state the truth and at the same time to recite an achievement unparalleled in all history for so short a time.

### Lubrication Oil Was Short

"Remember again that when these combat planes were contracted for, the only known lubricating oil adapted to their delicate parts was an oil made from castor beans. There were not enough beans in this country to make anywhere near the amount of oil required. Neither was there enough seed with which to grow the quantity of beans. The Signal Corps had to search the globe for seed and finally secured a shipload from distant India. Then the Signal Corps made a contract for the planting of the seeds in this country and has succeeded in having about 110,000 acres planted.

"It is now claimed that a form of petroleum has been developed that will answer the same purpose. This, however, is still in the experimental stage while the oil from the castor beans is known to be entirely adequate and reliable.

"Remember again that the cloth used in the wings of the

airplanes of all types has to be treated with acetone, a liquid substance which makes the cloth as fireproof as possible and also strengthens it for the immense strain to which it is subjected in the air. The Signal Corps is having this acetone distilled from wood under its own supervision on an enormous scale and at a cost of about $20,000,000.

"The Signal Corps has had to find a substitute for Irish linen as the material for wing cloth for training planes and has succeeded in adapting a certain cloth of staple cotton to this means.

"Coming now to the training planes, it may well be said that the completion of 3500 to date and the fact that they are now in quantity production, practically according to program, constitutes a remarkable achievement when the nature of the task is fairly weighed. The training plane is simpler than the battle plane and for that reason could be easier produced sooner, but the making of the training plane on a quantity scale is in itself a task of unprecedented difficulty and magnitude.

"Let it be remembered further that the Signal Corps had to put regiments of workers in the forests to find the spruce needed for the making of airplanes. Spruce trees are found among fir and other trees and of each 100 ft. cut, only about 15 per cent is found sound enough for airplane construction. Approximately 1,000,000,000 ft. of lumber had to be cut, inspected and tested for the necessary 100,000,000 ft. of spruce to be obtained.

"Propellers are made of mahogany and other highly durable wood and three or four must be made for each machine. This mahogany comes from the tropics and whether or when it can be brought to the seaboard depends upon tropical rains which swell the rivers to permit transportation.

"Let us now consider the Liberty motor. The Liberty motor could not fairly have been called an experimental and untried device. It represented a combination of what has been demonstrated to be best in all motor construction. The Signal Corps with its trained and skilled engineers understood that a foreign motor could not be adapted to American manufacture and turned out in sufficient quantities in anywhere near the time in which the Liberty motor could be produced.

"Foreign motors are based on the metric system of measurements, and so forth. American practice and American manufacturers are not adapted to this system. All parts made under the metric system must be converted into inches and fractions of inches under our system. The foreign motor is so extensively the result of hand work that it is with great difficulty adapted to machine work that dominates American practice.

"Furthermore, the Liberty motor is capable of 100 more horsepower than any foreign motor except a few of one single type, the Rolls-Royce. The Liberty motor develops 400 hp. ordinarily and is capable of 465 hp. The foreign limit with the one exception above mentioned is 300 hp.

"The Liberty motor has become so well established that the British government has asked for a large number. Sir William Weir, head of the British aircraft production, stated recently in London that he considered the Liberty engine the greatest single factor in the world's aviation program and that it was the most important single thing in the air program of England in 1918.

"As soon as the Liberty motor had been designed, arrangements were made for the manufacture of a very large number before the close of 1918. The exact figures are withheld for military reasons. Henry Ford agreed to produce a substantial number of the total, the Packard company another portion, the Lincoln Motor Co., Nordyke & Marmon, General Motors and the Trego companies still other portions.

"These companies were notified to get ready last summer and the actual contracts were signed later. They have spent the intervening time preparing plants, tools and workmen for the unprecedented work and are now on the eve of quantity production. The very names of these manufacturers are sufficient assurance that they would not take a day longer than necessary to lay proper and efficient foundations.

"The foreign planes which were accepted by the Signal Corps, known as light battle planes, were single seaters for which the Liberty motor is too heavy in horsepower, and were none of those offered by foreign concerns which came to America soon after the war to sell their wares, except the Handley-Page and that was not the plane which the Handley-Page people first offered here. It was untried and undeveloped and had not been accepted by the British.

"The Signal Corps sent a commission abroad to study foreign planes on the ground and accepted certain ones only after careful and personal study.

"On the whole, the record of the Signal Corps is one of which every American can be justly proud. In the face of unparalleled difficulties, it is accomplishing an unparalleled task with characteristic American energy, capacity, patriotism and enthusiasm."

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# New Philbrin Ignition Equipment

THE size and weight of ignition equipment has become a matter of increasing importance, particularly among manufacturers of aircraft engines, and it was largely due to the request of the Aero Engine Co. of New York that the Philips-Brinton Co. of Philadelphia developed its new model of ignition equipment which is herewith illustrated. The equipment has recently been slightly modified to reduce its size and weight and is shown in its new form.

Fig. 1 shows the interior of the breaker mechanism with which is also the condenser in the steel jacket at the top. The distributer mechanism, which does not show in this illustration, is mounted immediately above. It is a noteworthy fact that the plunger of the contact maker and the contact as well weigh only 0.02 ounce. No automatic governor is provided, the design of the contact maker being depended to obviate the need for spark advance. It is said that, while the duration of the contact is inversely proportional to the engine speed, no speed is ever attained which reduces the time of contact so much as to prevent thorough saturation of the coil.

As a result of the success attained with this new model, the Philips-Brinton Co. has decided to adopt it for standard production. Much interest was shown in the new device by automobile engineers at the national shows last winter. The complete unit, comprising the contact maker, condenser and distributer as regularly mounted, is shown in Fig. 2, the coil being separate and not shown.

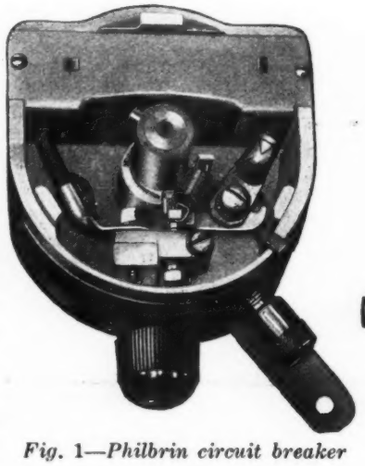


*Fig. 1—Philbrin circuit breaker*

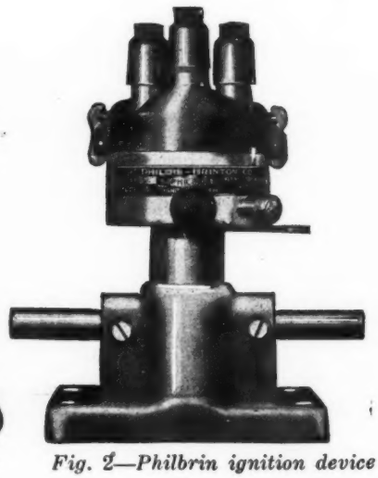


*Fig. 2—Philbrin ignition device*

# Machining Operations on the Backbone of the Fordson Tractor

## 25 Operations on 198-Lb. Casting Completed by 20 Machines at the Rate of 150 in 24 Hours

By J. Edward Schipper

THE entire backbone of the Fordson tractor built by Henry Ford & Son at Dearborn, Mich., is a 200-lb. casting. This casting is the answer to the question which has been puzzling tractor engineers throughout the country, because it accounts for the reason why the Ford tractor is successful without a frame. Besides being a housing for the entire transmission set, this casting is a bridge-like unit of tremendous rigidity, due to its barrel-like shape, and not only does it fulfill all the structural requirements of a frame, but it also fills a variety of purposes, such as acting as a foundation for the dash, seat and control units.

The tractor industry is new and, like all new industries, it is difficult to make performance design and production design coincide. For this reason it is a source of wonderment to men who have graduated into the tractor business from the implement industry how it is possible for a concern which only started production in October to be turning out tractors at the rate of 100 per day the following March. It is true that the present tractor is the combination of a design first conceived in 1907. But it is one thing to develop a design which will be satisfactory on the farm and another to make that design suitable for steady production and rapid handling in the machine shop and assembly room.

With Henry Ford's recognized genius for production, it is not a matter for surprise that he is the man to first get down to a sound basis in this important feature of manufacture. Looking back on the automobile industry, it is now possible to see that the methods introduced by Henry Ford in producing a sound low-priced car early in the development of the industry has had a marked influence on production methods of cars and has been one of the most influential factors in developing the great passenger car productive ability of this country. Whether or not Henry Ford will have the same influence on the tractor field remains still to be seen, but even now, with production only 6 months old in a plant which is day by day growing while production increases, several lessons of great benefit to the tractor industry can be drawn from the Dearborn plant.

It is natural that developments in tractor production should come from an automobile manufacturer. The implement industry has practically stood still for 50 years. Farm implements bought to-day are almost identical with those purchased half a century ago. It is not like the automobile, which changes and improves annually. This, of course, is a matter which is to be expected when it is considered that 50 years in the implement industry is only a small percentage of the hundreds of years spent in developing farm implements, whereas 3 years in the automobile industry is about 20 per cent of its existence.

The Ford tractor, like the Ford car, has been developed from first principles. The problem of what the tractor must do has been first perceived and then a solution worked out regardless of precedent or of the practice followed by other concerns. This brings us back to the casting which forms the backbone of the Ford tractor. Without doubt, this is the biggest production problem in the tractor, and an explanation of the methods used in handling it will clearly illustrate the methods pursued in making the Ford tractor a production proposition.

The weight of the casting averages 198 lbs. This weight is gradually being reduced, but at the present time 198 lb. is close to the mean.

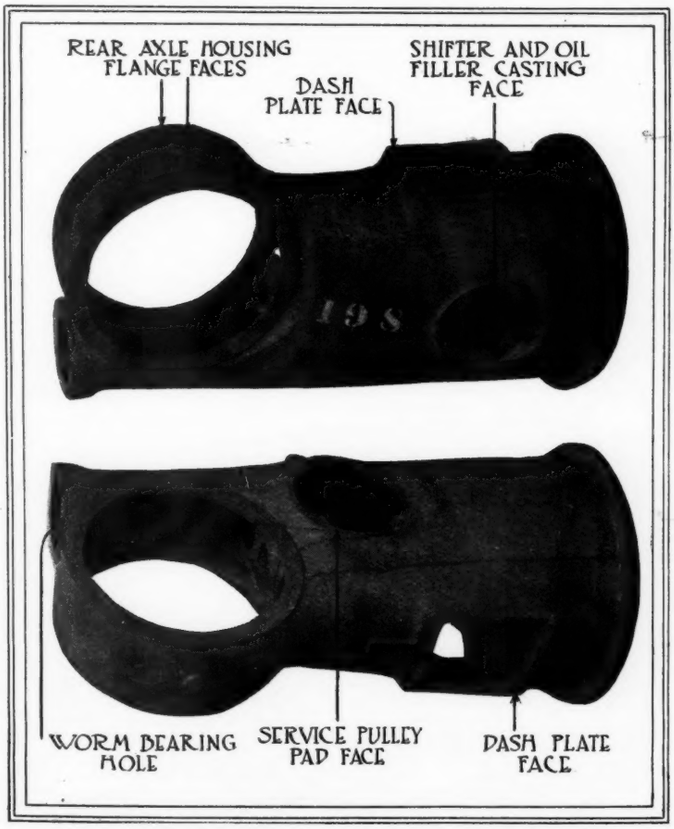



Fig. 1—Both sides of the transmission housing casting which forms the main body of the Ford tractor. This casting weighs 198 lb.

Fig. 1 shows both sides of the transmission housing casting. The number stamped upon it, 198, is the weight in pounds. The illustration shows the raw casting, and by approximately twenty-five operations handled on about twenty machines, fifty of these castings can be put through in 8 hr., or 150 in the full 24 hr.

The first operation is shown in Fig. 2. In this a locating hole is drilled in the casting, the only purpose being to locate the next operation, which is really the primary job on the casting. The drilling of the locating holes shown in Fig. 2 costs nothing beyond the maintenance of the drill, as the same operators on the next job take care of it. This hole is drilled in much quicker time than the next operation, which is a boring and facing job, as will be explained, so that the operator can readily have the locating holes drilled in several castings before he places them on the next machine.

The locating jig which takes care of the drilling

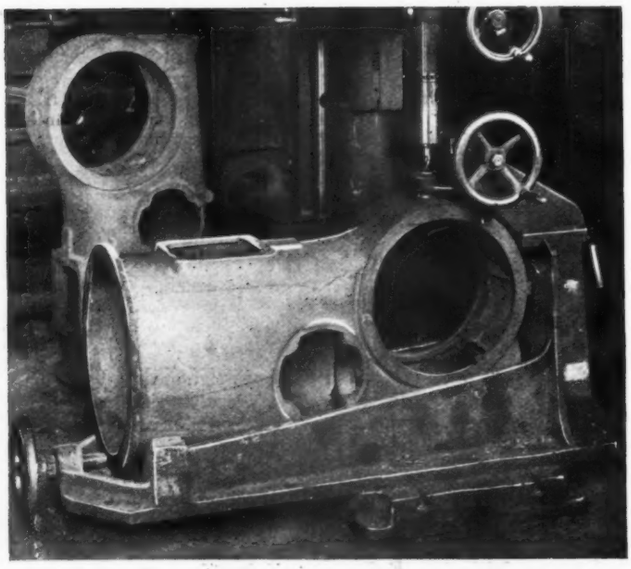


Fig. 2—Drilling locating hole in casting. The only purpose of this hole is to locate future work. The operation costs nothing beyond the maintenance of the machine, as the same operator as on the next job takes care of it. He drills this hole in the casting while the milling machine described in the next operation is at work. There are two lathes on the next job, so that there are two operators always at work in preparing castings for the milling machine

of the locating hole centers the casting by means of the opening at both ends. The wide end of the casting is the front and the flange at this point bolts against a flange in the cylinder casting, and hereafter in this article we will refer to this end of the casting as the cylinder flange. The rear end carries the worm for the worm drive, and the hole at the rear end carries the worm bearing. This will be referred to as the worm-bearing hole.

The locating jig in drilling the locating hole illustrated in Fig. 2 centers the worm-bearing hole and the cylinder flange. The back of the casting is first located by equalizing levers, as shown in the illustration, and this brings the locating hole in the proper position. There is a slight boss on the casting through which the locating hole is drilled.

In Fig. 3 is shown the first manufacturing job on the casting. The illustration shows one machine on this work, but there are really two to slit up the work between them. The machine is a 24-in. American lathe, and the operation is to bore and face the rear axle housing flange. These operations are done on the same machine with one setting, a compound tool doing the work.

The jig for the machine locates the work from the hole, which was described in the last operation, the hole fitting over a dowel pin. There is a taper centering gage on the jig which centers the cylinder flange and the worm-bearing hole with an expanding chuck.

The tool first makes a rough cut, and the order of operations on this machine is: first, rough bore; second, finish bore; third, rough face; fourth, finish face; fifth, chamfer rear axle housing flange, thus breaking the corner on the edge of this flange.

The time required for the work is twenty-two in 8 hr., on one machine, or between twenty-two and twenty-three minutes apiece. This operation faces the width of the rear end of the casting against which the flanges of the housing bolt.

An idea of the close limits to which this casting is held in spite of its weight may be gathered from the fact that the limit of the job is 1.002 in., the dimensions furnished the machinist being 7.006 to 7.008 between faces.

The operation shown in Fig. 4 is to face, turn, under-face and chamfer the cylinder end flange face. There are two machines also on this job and they finish both sides of this flange. The machine used is a Colburn vertical boring mill having a 72 in. capacity, and the average time spent on the job is 22 min. The work is located from the faces of the rear axle housing flange and from the cylinder flange diameter. The operation finishes this flange. Another point which will be noted in following the work of this casting through from this point is that most of the locating is done from the rear axle housing flange faces.

In Fig. 5 is shown the operation of facing the rear end bearing for the worm. This is done on a Lucas boring mill at the rate of fifty in 8 hr., or about 9 min. for each job. The boss indicated in the casting shown in this illustration is no longer used. It was formerly employed as another locating point, but now that the locating jigs use the rear axle housing flange and the cylinder flange diameter as the primary locating point, it is no longer necessary.

A plate bolts against a face within the casting to locate the transmission gears and to hold it in place. The face against which this plate bolts is known as the transmission plate face, and the machine illustrated in Fig. 6 shows the work of facing this plate face. Two identical machines are used on this work, one rough-facing and one finish-facing. They are both Walcott 24-in. lathes, handling the work in 8 min., and the jig locates the work by the rear axle housing, flange faces and the cylinder flange diameter.

On the casting is a flat face upon which bolts the dash complete. The operation shown in Fig. 7 is milling and facing this face against which the dash bolts. There is one machine used on this work, this being a Brown & Sharpe universal miller. The time required for the work is 8 min., and the work is located by the transmission plate hole and the rear axle housing face. There is a limit of about 1/64 in. on this work.

The next operation consists of boring and facing the service pulley hole. This is done on a No. 2 Minster heavy duty

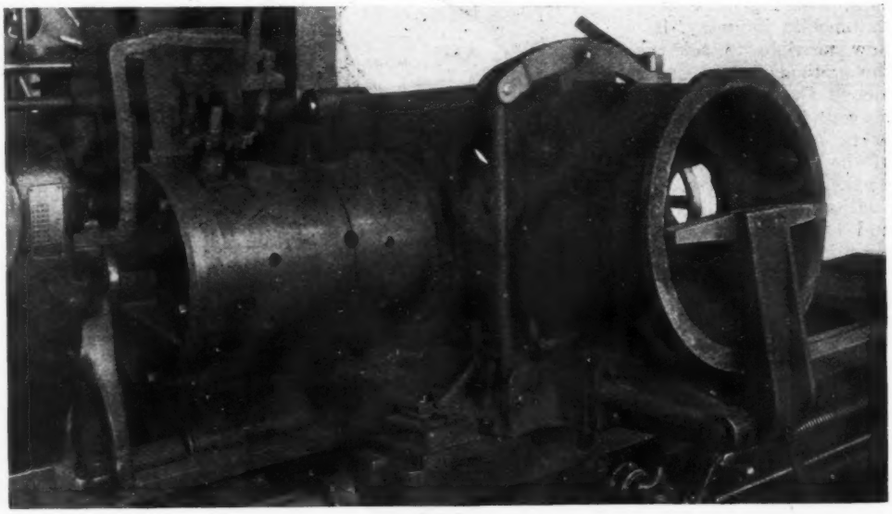


Fig. 3—There are two 24-in. American lathes on this job and their work is to bore and face the rear axle housing flange. Operations are on the same machine with one setting, a compound tool doing the work. A jig locates from the hole which was described in the last operation and this hole fits on a dowel. There is a tapering centering gage on this jig which centers the cylinder flange end and the worm-bearing hole with an expanding chuck. The tool first makes a roughing cut, the operation being: a, rough bore; b, finish bore; c, rough face; d, finish face; e, chamfer rear axle housing flange to break corner. Time required for the work is 22 in. 8 hr.

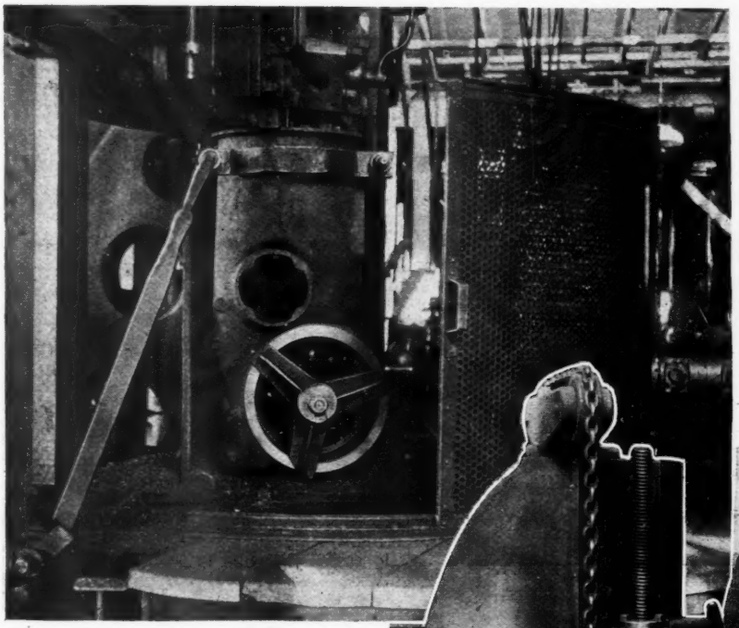
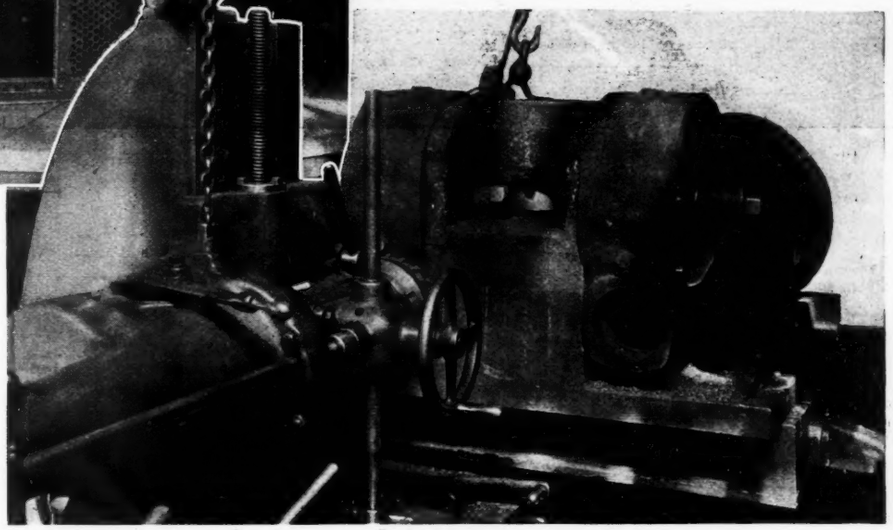
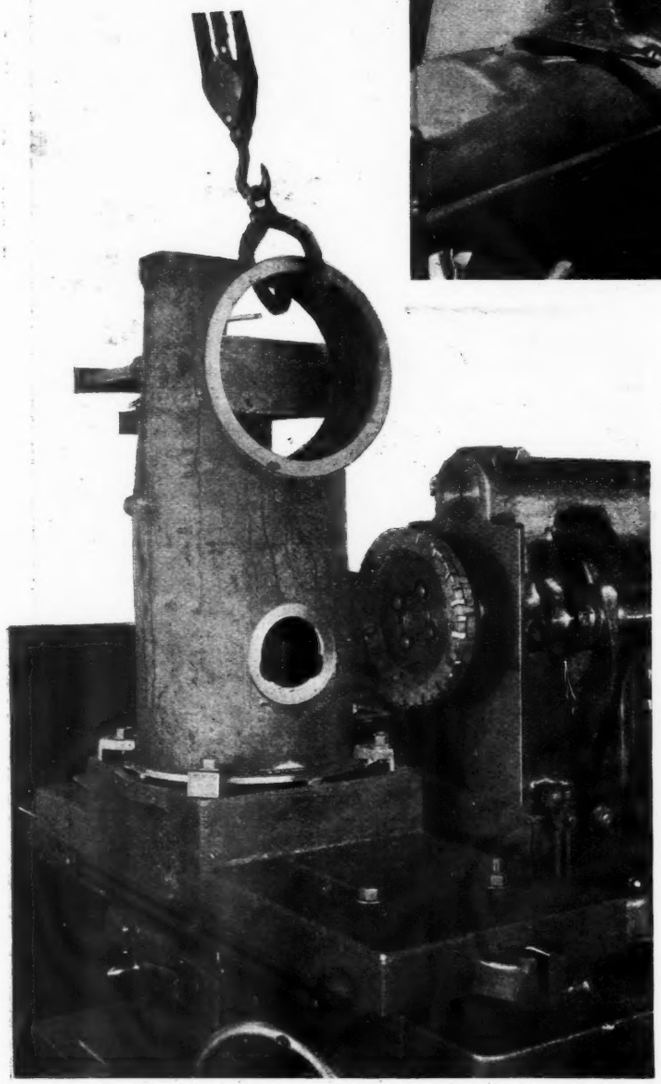


Fig. 4—There are two machines on this job facing, turning, under-facing and chamfering the cylinder end flange face. Both sides of the flange are faced. This is a Colburn vertical boring mill, 72 in. capacity. The average time is 22 min. The work is located from the faces of rear axle housing flange and the cylinder diameter. This work finishes this flange

Fig. 5 (Below)—Facing off the rear end bearing. This is done on a Lucas boring mill at the rate of 50 in 8 hr. It takes about 8 min. for each job; the time varies with nature of the casting. The boss shown in the illustration is no longer used. The machine is made by the Lucas Machine Co., Cleveland. Limit on the length of the casting is 1/32 in., dimensions being 35⅝ to 38 21/32





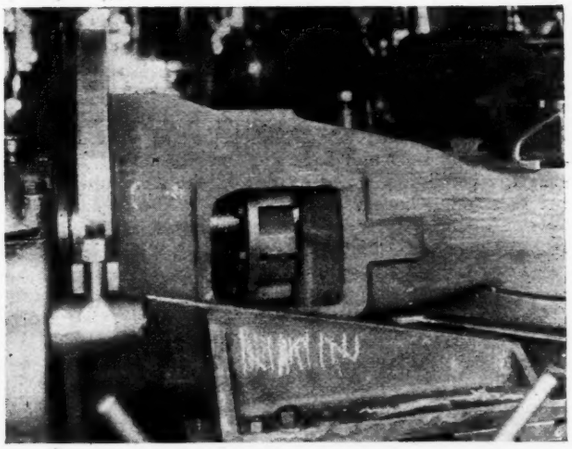


Fig. 6—Two identical machines on this work, one roughing and one finishing. These are Walcott 24 in. lathes—boring and facing transmission plate face. Time required, 8 min. Work located by the rear axle housing flange face and cylinder flange diameter

Fig. 7—Milling or facing dash face. Dash plate bolts on this face, carrying dash complete. One machine on this work. Brown & Sharpe universal miller used. Time required for the work is 8 min. Work located by transmission plate hole and rear axle housing face. About 1/64 in. limit

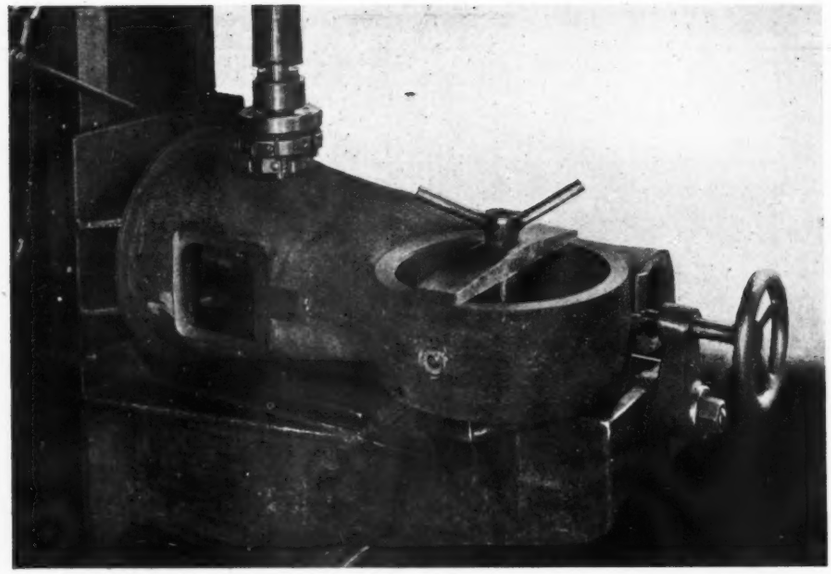


Fig. 8—Boring and facing service pulley pad. Located from transmission plate face and rear axle housing face. Time required, 5 min. Combination fixed boring and facing tool. Minster drill press

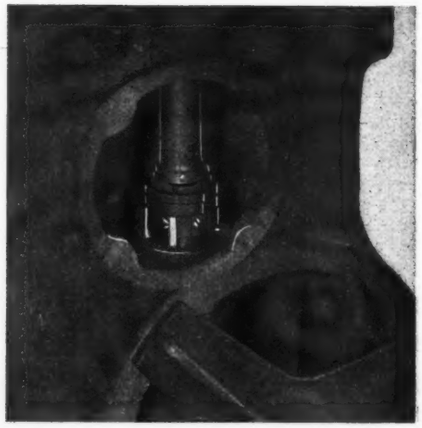


Fig. 9—Rough bore and finish boring upper transmission shaft bearing. Work located by service pulley pad and rear axle housing face. Done on Minster drill press, made by Minster Machine Tool Co., Minster, Ohio. Time required, 5 min. Dimensions, 3.544 and 3.546, giving .002 limit

drill. The tool used is a combination boring and facing tool with a pilot entering a bushing in the main body of the fixture. The dimension for this hole is taken from the face of the transmission plate hole.

Within the casting there are bearing holes for the ball bearings used to carry the main and lay shafts for the gearset. The work in Fig. 9 is the rough-boring and the finish-boring of the upper gear shaft bearing hole. This work is located by the rear axle housing face and by the service pulley pad, this pulley pad being the face against which the pulley shaft bearing housing bolts. The work is done on a No. 2 Minster drill press, the time required on the job being between 4 and 5 min. The dimensions furnished the operator on this work are 3.544 and 3.546, giving a .002-in. limit. The method of locating is the same as in the previous operation.

### Boring Worm-Bearing Hole

Boring the worm-bearing hole is the next operation. This is done on two No. 2 Minster drills, one being used for roughing and one for finishing. The casting is located by the rear axle housing hole and face and service pulley hole. In this case the boring tools are guided in the fixture directly above the hole being bored.

On the opposite side of the casting from the pulley pad there is a gear shifter pad face against which bolts a casting carrying the gear shifter lever and also the oil filler neck, which at the same time acts as a foot rest for the operator.

The operation shown in Fig. 11 is to face this gear shifter pad face and the machine which is used for the operation is a Lucas No. 31 boring mill. The time required on the work is 8 min., and the locating is done from the rear axle housing face and the cylinder flange diameter.

### Finish-Boring Lower Transmission Shaft Bearings

One of the most ingenious pieces of work on the casting is done in the next operation, which is shown in Fig. 12. In this it is necessary to rough and finish bore the lower transmission shaft bearings. These are done on similar machines, the roughing cut which is illustrated being done on an American 24-in. lathe. The work is inside work and it requires a long shaft on the tool in order to reach the hole which is to be bored.

The view shown in Fig. 12 is taken by looking down through the gear shifter pad hole, which is the same hole which is described in manufacture in the operation shown in Fig. 9. The illustration, 12A, shows the set-up for this work. The ingenious part of the scheme is the method for having

Fig. 10—Two machines on this work, one roughing and one finishing rear worm bearing hole. Minster 2½ in. boring machine. Time required, 5 min. Dimensions, 5.513 to 5.515. Limit, .002

the guide for the boring shaft combined with the fixture. This can also be seen in Fig. 12 by looking at the end of the casting, where the guide can be perceived.

The remaining operations on the casting are largely drilling and tapping the various flanges which have been described in the previous operations. Fig. 13 shows the method of drilling

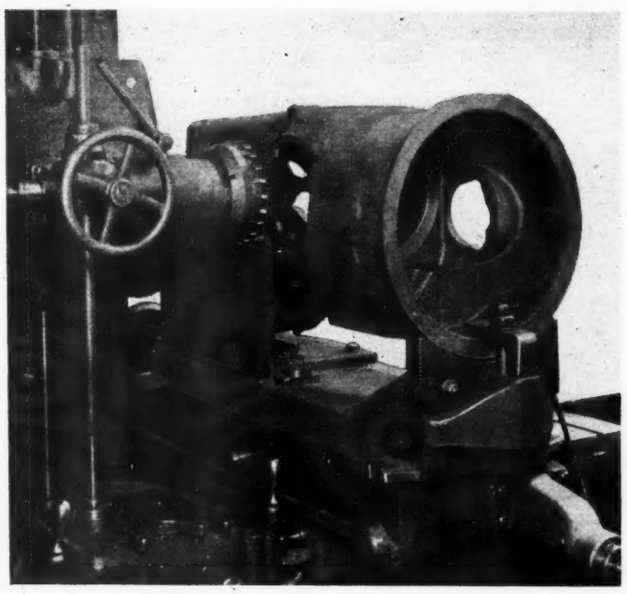


Fig. 11—Facing gear shifter pad face, located by rear axle housing face and cylinder flange diameter. Time required, 8 min. Lucas No. 31 precision boring mill

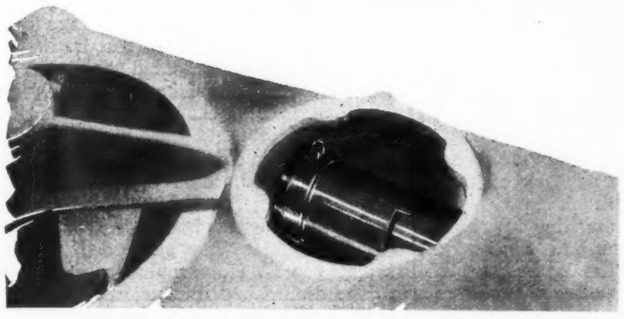


Fig. 12—Roughing and finishing lower transmission shaft bearing looking through gear shifter pad hole. Roughed on American 24 in. lathes located by rear axle housing face and service pulley pad. Time required, 4 min.

the cylinder flange. This is the wide flange, as described, at the front end of the casting, and the drilling fixture for this operation also acts as a fixture for the next operation as far as locating is concerned.

This first drilling operation is done on a Baush multiple-spindle machine having sixteen spindles. Twelve of these are 15/32 in. holes, two are 17/32, and two 27/64. Two of these latter holes are afterward reamed out to 7/16 to act as locating holes for dowel bolts used in the assembly work. These holes coincide with holes in the cylinder casting, and when the frame is brought against the cylinder casting these dowel bolts bring the casting to its proper position, allowing for quick bolting up. The work is located from the rear axle housing flange and the dash plateface. It requires 8 min. to do the work, including both this and the next operation.

Without changing fixtures, the operation shown in Fig. 14 is completed, the same jig being used as was used in Fig. 14 except that the top plate which guided the drills for the cylinder flange are removed, allowing the nine spindles for this work to go into the inside casting and drill the nine holes for the bolts of the transmission plate face. Eight of these are tapped to ½ in. U. S. standard thread and the other reamed to 7/16 in. for a locating dowel; as the same jig is used in this operation as in the previous one, the location is not changed.

It requires but 8 min. to do all the remaining drill work on the outside of the casting, and this is taken care of by a trunnion jig operating on tracks below the multiple-spindle machines. The train of drills to go with the trunnion jig are shown in Fig. 15 and in Fig. 16. Fig. 15 shows the drilling of the rear axle housing face on the left side of the casting. The operations are:

A—Drill rear axle housing face left side.
B—Drill rear axle housing face right side.
C—Drill shifter pad face.
D—Drill dash face and seat.
E—Drill service pulley face.

These complete the work on the trunnion jig and the casting is then removed from them and is forwarded to the tapping operations. In Fig. 16 the jig is shown in an upright position, while in Fig. 15 it is horizontal. The work done in Fig. 16 is to drill the dash face and seat hole. The 9/16-in. x 12 top holes in the end of the worm-bearing hole are drilled next. This is done in a 24-in. Cincinnati drill press with a 4-spindle head. The casting rests on base of drill press.

The set of tappers, composed principally of Hammond tapping machines, is shown in Fig. 17. This is common machineshop practice, the work being to ream three dowel locating pin holes to 7/16 in., tap eight, ½-in. U. S. standard holes for the transmission plate face. Twelve 9/16 in. x 12 U. S. standard holes in each side of rear axle housing hole, four 9/16-in. x 12 holes in dash pad, four ½-in. x 13 holes in

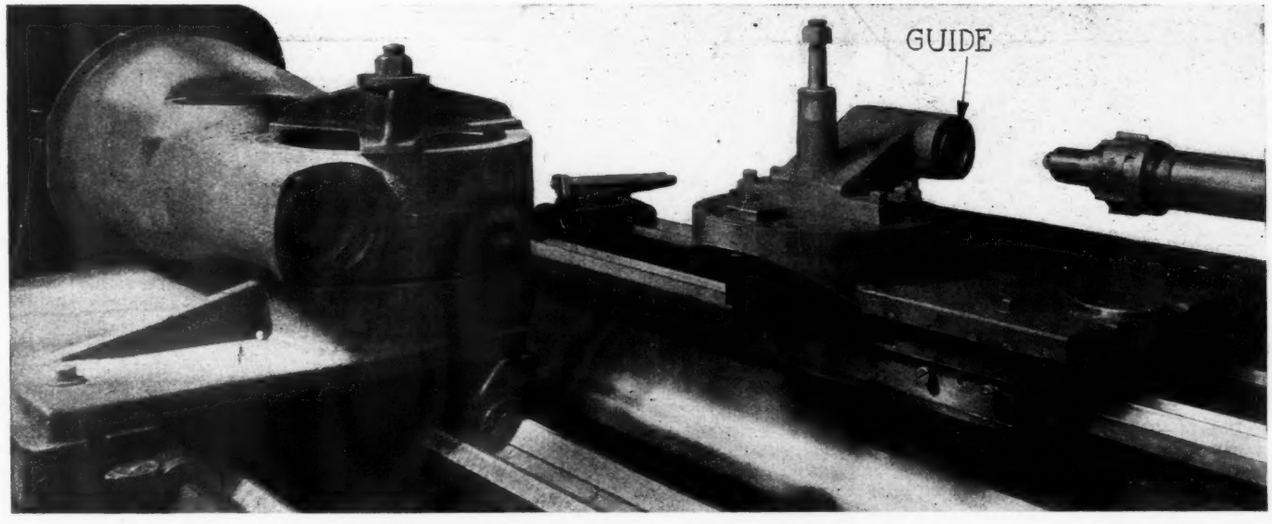



Fig. 12A—Another view of operation shown in Fig. 12 showing guide for boring shaft in end. Note the fixture in the background with boring tool guide. This is a new idea in fixture work

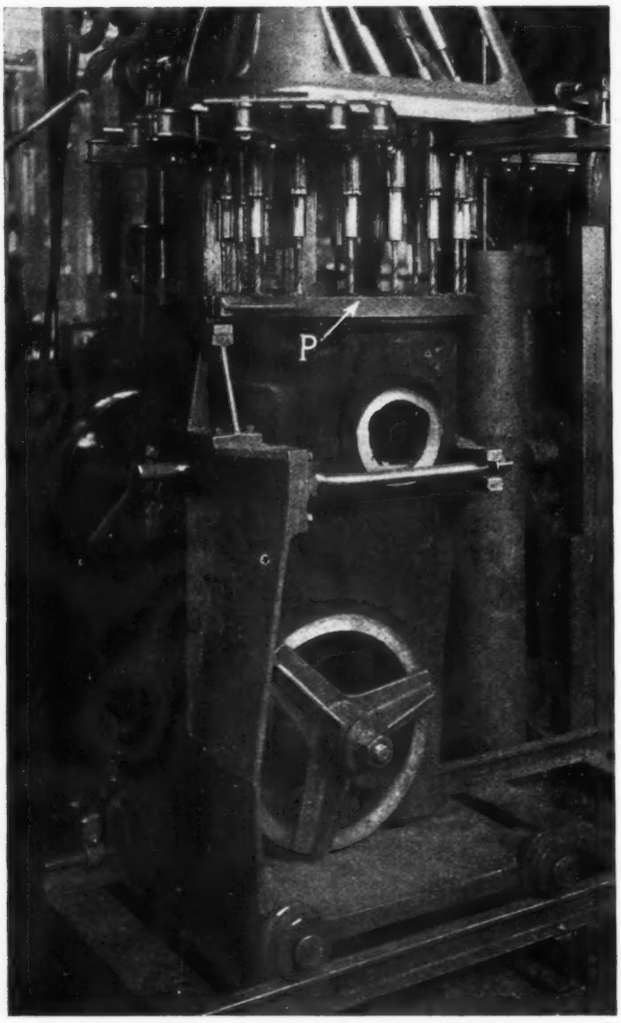



Fig. 13—Drilling cylinder flange. Note drilling fixture. This is a sixteen-spindle operation. There are twelve 15/32 holes, two 17/32 and two 27/64. Two of the holes are reamed out later to 7/16 to act as locating bolts for assembly work. These fit over dowels on the cylinder casting. Eight minutes is required to do this entire job. The work is done on a Baush multiple-spindle drill. Plate P is removed for the next operation

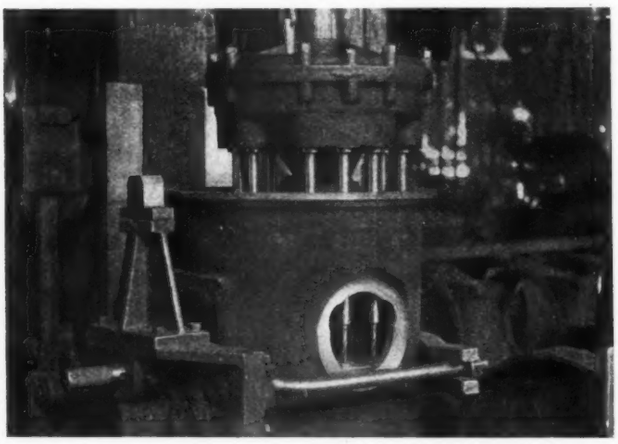


Fig. 14—This operation comes immediately after Fig. 13, the same jig being used except that the top plate, which was used for guiding the drill, comes off the fixture, and this operation drills nine holes for bolts of transmission plate face. Eight of these are tapped to ½ in. U. S. standard thread, and the other reamed to 7/16 for a locating dowel. The work is located the same as in Fig. 13

gear shift pad, six ½-in. x 13 holes in service pulley pad and four 9/16-in. x 12 holes in worm-bearing end. Two holes are tapped by hand, these being the seat hole, which is a ¾-in. U. S. standard, and the oil drain hole, which is ½-in. pipe standard. This completes the production work on the casting.

After finishing with the tappers the casting is carried to a final checking and inspection department, where gages particularly designed for the work check it up by the usual inspection methods. In spite of the size of the casting and the difficulty which would naturally be expected in handling a 200-lb. gray iron unit by production methods, the percentage of rejections is very small.

The large, convenient size of this casting makes it particularly useful as regards assembly work, the various ball bearings being simply pushed into the holes on an arbor press, and the transmission units, which are semi-assembled, can be quickly dropped into place.

The efficient handling of the casting and its great adaptability for production work are large factors in the ability of the Ford tractor plant to turn out from eighty-five to 100 tractors a day at the present time and with increasing schedules monthly until it is expected to reach 300 a day by next December.

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# Type Designations of German Airplanes

SOME curiosity has been shown as to the meaning of the letters and Roman figures carried conspicuously on all of the German war planes. These characters designate the type of plane and the particular model. At the outbreak of war the large group of "Taube" (Dove) monoplanes made in substantially standard form by firms like Albatros, D. F. W., Etrich, Jeannin and Rumpler, was classified as type A, that of the 100-hp. tractor biplane, manufactured chiefly by Albatros, Aviatik, D. F. W. and L. V. G., being identified by the letter B.

When the monoplanes, which were chiefly used for the early war task of patrolling, disappeared, some time passed till the A class was again represented. The Fokker was the first machine to which it was applied again, being designated by A. II. Similarly, the B. I. biplanes were succeeded, during the latter part of 1915, by the B. II. aeroplanes, the main features of which were the diminished dimensions.

The war having by now taught the enemy how to equip for fighting, bomb dropping, wireless direction of artillery and photography work, the C class was developed along the lines of and at the same time as the B. I. aircraft, the horsepower being increased to 160 in the C. I. type, which could tackle each of the before-mentioned tasks.

### Has Two Machine Guns

The model C. II. showed an increase in horsepower to 175, with a decrease in dimensions, the equipment comprising bomb-dropping facilities through two cylindrical holes in the body or for four bombs hanging below it. In the C. III. the dimensions were still smaller—a span of 36 ft. and a wing surface of 360 sq. ft., and the main feature was the fitting of two machine guns—a fixed one, fired through the propeller by engine gearing released by the pilot, and a movable one, operated on a gun turret by the observer.

The C. IV. type is equipped with engines of increased horsepower. At first a 220 hp. was fitted either as a six-cylinder Benz or an eight-cylinder Mercedes of two meters length; later a six-cylinder Mercedes of 260 hp. was adopted.

When real air fighting started the Albatros, Friedrichshafen and Halberstadt D fighters were produced. The E type includes the Fokker and Pfalz Morane adaptation with the Oberursel (Gnome copy) motor, which was made in steadily increasing outputs up to 160 hp., which appeared by the middle of 1915 but did not survive the year 1916.

No aircraft on the fighting front has carried the letter F, it having probably been thought more appropriate to use the letter G for the first specimen of the "Grossflugzeug" (giant aeroplane) class, represented by the Gotha, A. E. G., Albatros and Siemens bombers, just as D stood for Doppeldecker (biplane scout fighters) and E for Eindecker (monoplane).

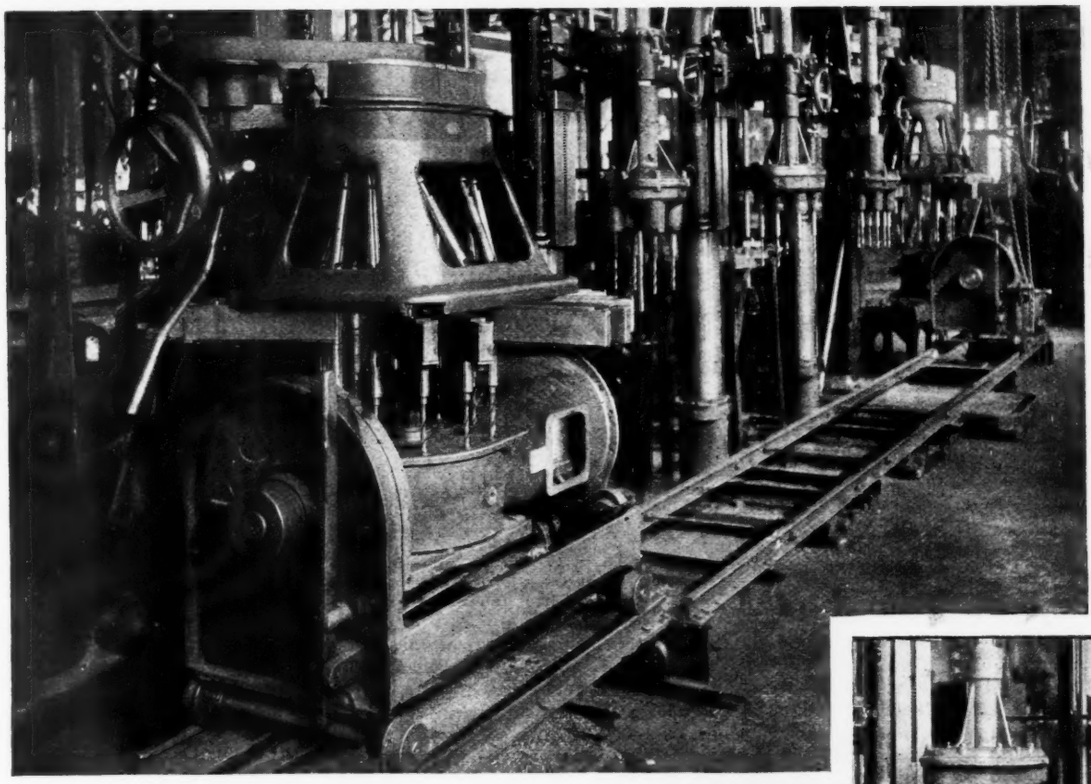
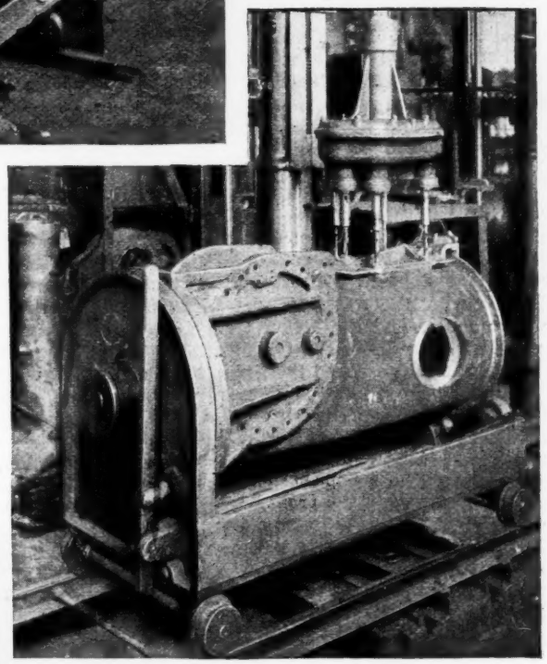


Fig. 15—Drilling the outside complete. All faces are taken care of by a revolving jig. It takes 8 min. to do the complete work on drilling the exterior of the casting. There are five operations on multiple-spindle drills and the jig can be rotated to bring the casting to the desired position. The five are:

A—Rear axle housing face, left side of casting
B—Rear axle housing face, right side of casting
C—Shifter pad face
D—Dash complete and seat
E—Drille service pulley face



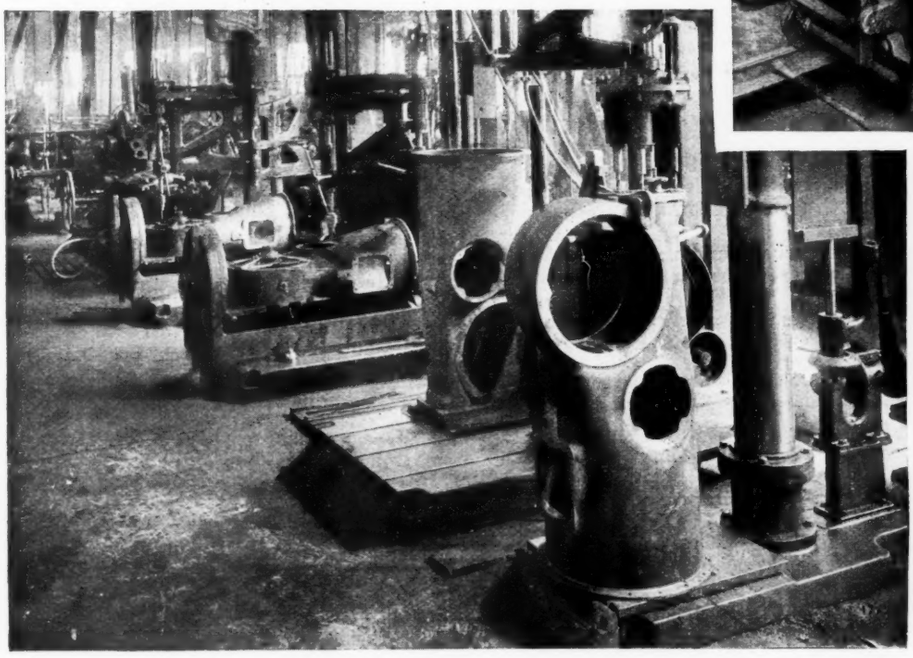


Fig. 16—Dash face and seat hole drilling. The photograph shows jig in upright position. Work located from the rear axle housing faces and cylinder flange diameter. The finishing operations are now taken care of on both outside and inside of casting and are tapping jobs

Fig. 17—Shows the tapping set, which is composed largely of Hammond tapping machines. Two holes are tapped by hand, these being the seat hole, which is ¾ U. S. standard, and the oil drain, ½ in. pipe standard

# Traction on Bad Roads or Land

## Part V

### Motor Sleighs Developed for Arctic Exploration—Applications of Chain Track Tractors—Historical Review Covering the Differential Gear, Differential Gear Substitutes and the Chain Track Principle

By L. A. Legros

THE Wolseley motor sleigh was designed and built for Captain Scott's Antarctic expedition in 1909; three of these motor sleighs were made with the object of facilitating transport over snow and ice.

A previous attempt was made by B. Hamilton to design a vehicle to cross hummocky ice and humpy snow and ice, but on test in the Alps it was not found to meet the conditions sufficiently well. The Wolseley machine was designed to work with chain tracks and to form a motor sleigh. The first vehicle, which was completed in February, 1910, passed its tests satisfactorily on Lake Fefor in Norway. The vehicles were used by Captain Scott, and rendered much assistance in the earlier stages of the expedition, but were left behind in the final dash for the South Pole.

The vehicle is remarkable in the arrangement of bearers which take the load; these are of wood, shod with sheet aluminum to avoid "snow-clogging." The chains were of soft steel links with wooden rollers. It is to be noted that the arrangement adopted differs from any of the other tractors described, as the rollers travel with and at the same speed as the chain, and the rollers also form the gearing surface with which the driving and idler sprockets engage. The heads of the bolts that secured the links to the chain feet were made of pointed form, as shown in the illustration so that the vehicle could travel equally well on smooth ice or over snow so loose that a man could only travel over it on skis. The engine was of 12 brake horsepower, air-cooled, transmitting its power through a two-speed box to a differential box and axle at the back end. The front axle carried two idlers. The speeds provided were 1.75 m.p.h. on low gear and 3.5 m.p.h. on top gear. In the trials made at the works it was found possible to drive the machine over loose ashes without scattering them in any way. The motor sleigh was capable of climbing with ease a gradient of 1 in 2 (about 27 deg.)

#### Mixed Tractors

By mixed tractors are meant tractors in which the traction can be effected wholly or in part by chain tracks, the load being carried on wheels; the only example of this class known to the author is the Lefebvre tractor.

This vehicle is designed to travel on wheels when running over the ordinary road, the tracks being raised out of contact with the ground.

The tracks are of a construction quite different from any of the heavy-weight carrying tracks previously described. In this instance light steel case-hardened spade plates of L-section are attached to the pitch chains, each plate bridging six links of the chain. The spades present a vertical face to the ground, into which they cut when the chain is assisting the wheels. The aggregate surface so presented is that of seven plates on each track measuring about 4 in. by 6.5 in., giving a total area of about 360 sq. in., available for propulsion on soft ground on which the wheels would not grip. These chains on each track are carried on a frame, pivoted about the rear or driving sprocket, which is not concentric with the axle of the back wheels, but placed at some distance behind the axle. A jockey pulley carried on the track frame depresses the chain slightly in advance of the rear sprocket. Vertical guides with a power-operated screw gear enable the track frames to be depressed or raised through the full range in 15 sec. under control of the driver. The adherence chains are so geared as to travel at the same linear speed as the periphery of the driving wheels, but a dog-clutch carried on the sprocket shaft enables the chain drive to be disconnected when the chains are elevated and the tractor is running on hard ground.

It is claimed that with the assistance of the adherence chains the tractive effort can be as much as 50 per cent of the weight of the vehicle.

#### Applications of Chain-Track Tractors

The following are examples of work done by chain-track tractors where roads are poor or absent, and heavy loads required to be moved:

Timber—80,000 ft. of green rough timber hauled 15 miles over snow and ice track at a temperature 42 deg. C.; the return journey of 15 miles without load, but with empty sleighs. Water tank and caboose for crew are included in the load both ways.

Clay and Gravel—Hauling five to six wagons loaded each with 6000 lb. over heavy sand and over black land.

Plowing Virgin Country—Turning a 30-in. furrow 12-in. deep through scrub.

Plowing with five 14-in. plows to 8-in. depth, or with six 14-in. plows to 6-in. depth (45 hp.)

Plowing 40 acres per day (75 hp.).

Plowing partly drained marsh land.

Plowing volcanic ash soil.

Plowing a hillside.

Plowing 16-in. deep in Texas Panhandle.

Plowing 12-in. deep in black adobe.

Plowing with a gang of twenty-one disk plows.

Plowing in sugar plantations, Cuba.

Plowing 15 acres per day (35 hp.).

Plowing 100-in. wide by 7-in. deep in sandy loam (35 hp.).

Rice Farming—Plowing, harrowing and seeding. The chain tracks enable irrigation ditches to be crossed; the tractors also haul harvesters and binders in the harvest season and do the work of the ditching.

Ditching—Hauling a ditcher for laying tile ditches.

Road making and grading.

Hauling material through desert sand for Los Angeles Aqueduct.

Cleaning land for Catskill Aqueduct.

Hauling rock, ore and road material.

Hauling load of 17 tons up a 20 per cent grade in Utah (75 hp.).

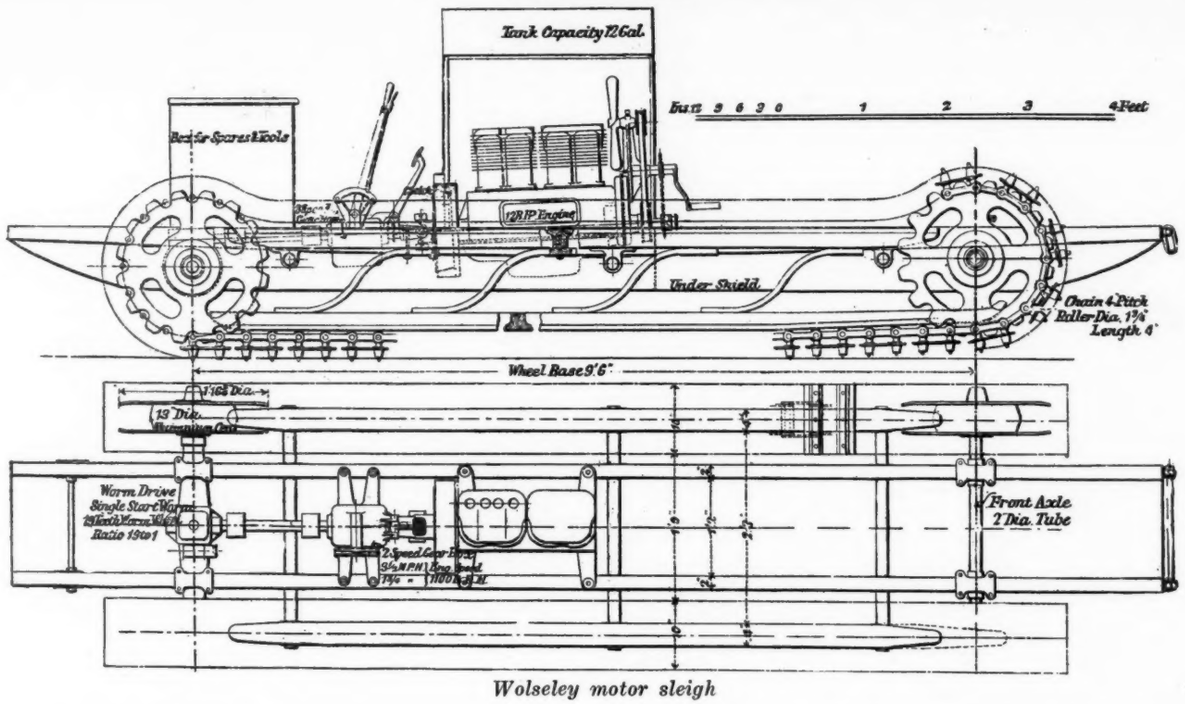
Hauling load of 40 tons of rock across country for highway construction in California (75 hp.).

Hauling pile driver in marshy land.

Hauling house weighing 50 tons 1½ miles in 45 min. on dirt road (50 hp.).

Hauling excavator.

Hauling scarifier.




*Wolseley motor sleigh*

Hauling sprayers.

Hauling harvester for 20-ft. cut.

Hauling 8-ft. double disk cultivator.

Hauling and operating hard-pan driller on fig plantation, California, for planting by dynamite.

For all the above operations it is estimated that the cost of haulage by tractor is from one-third to one-half of that by horse or mule.

In the instances quoted a few only of the appliances hauled or operated are designed specially for use with chain-track tractors.

Where heavy loads have to be carried over sandy and boggy country or through wide shallow fords with soft bottom, it is possible to extend the principle to haulage wagons fitted with chain tracks; by this means a 100-hp. tractor can haul a train of four wagons, weighing 5 tons each, and carrying a load of 10 tons each, or a total dead load of 60 tons and a paying load of 40 tons, over soft ground capable of supporting only 7 lb. or 8 lb. per square inch.

The Pedrail, fitted with an improved roller chain, arranged with two sets of rollers with axes at right angles to take vertical and horizontal loads respectively has been tried on a haulage wagon for stone. The rolling friction is reduced by this arrangement to so small an amount that the vehicle will roll back on a 2 per cent slope.

### Other Applications of the Chain Track

Trenching, ditching and farm drainage machines with chains of dredger buckets or excavating wheels are in many instances carried on and propelled by chain-track supports.

The Parsons Company of Newton, Iowa, make nine models of trench excavators; particulars of six of the larger models are given in Table II.

The model 60 Trench excavator is carried as to one-half of its weight on chain tracks, the other half being distributed over pairs of leading and trailing wheels. The machine is steam-driven, and comprises a conveyor for landing the spoil at an adequate distance from the trench.

The model 48 Trench Excavator is carried as to 75 per cent of its weight on chain tracks, the remainder being carried on the leading wheels; the machine is driven by an internal-combustion motor of 62 hp.

The model 24 Trench Excavator is of smaller size and fitted with a 30-hp. motor; 71 per cent of its weight is carried on the chain tracks and the remainder on the leading wheels.

Of the other models, one is entirely carried on chain tracks, the steering being effected by clutches as in the smaller models of chain-track tractors (Burford-Cleveland, etc.).

The F. C. Austin Drainage Excavator Company are makers of seven models of trenching or ditching machines capable of digging trenches from 6 ft. to 25 ft. deep, and from 15 in. to 72 in. wide. The rate of digging is stated to vary from 10 ft. 3 in. per minute. The motors are from 18 hp. to 85 hp. The soil can be delivered either to the right or left or to both sides of the machine as may be desired.

Another series of four models is constructed by the Austin Company and arranged for performing the further operation of bank-sloping for the sides of the trench, either as a single operation or by roughing and finishing operations. The wheel of the excavator, over which the chain of buckets passes, is formed of two truncated cones, arranged base to base, the conical surface being represented by sloping cutter bars capable of cutting away hard adobe soil. The wheels are constructed for various slopes of bank from ½ to 1 to 1 to 1; the machines can be used for preliminary work in railroad construction, trenches being cut on each side of the land to be used, and the spoil from the two trenches conveyed to the middle of the strip where it is made up to formation level, berms of the desired width being left on each side between the ditch and formation.

Those ditching machines which are intended to perform consecutive operations of trenching and bank-sloping have the chain tracks arranged to straddle the trench; this necessitates great breadth of the machine, which will measure as much as 14 ft. 6 in. between the insides of the chain tracks for cutting a ditch 10 ft. wide at the top.

Applications of trench excavators comprise cutting trenches for sewers, water mains, gas mains, electric light and power cables, as well as work for street railways and railroads.

The land dredges having cut the ditches or trenches at high speed to the required depth, and the sewers or mains having been laid, it is necessary to fill in the spoil again. For this purpose a different class of machine is used, which is virtually a locomotive crane also carried on chain tracks. These machines are made by the constructors of trench-excavating machinery, and handle the spoil either with a clam-shell or grab bucket or with a drag-line bucket or a combination of the two for use alternately.

Further extensions of the use of the chain track for carrying pile-driving machinery as well as that used for road making and for deepening channels in shallow streams may be expected in the future.

In conclusion it can be safely said that where a track can be found 7 ft. wide which does not present rocky obstacles over 10 in. high, whether over sand, ash, clay, marsh, snow or ice, on the level, or on gradients up to 30 per cent, the

chain-track tractor has proved itself capable of traveling and performing useful work beyond the capacity of animal haulage.

For this reason the chain-track tractor may be expected to occupy a position of ever-increasing importance in the development of new countries, and in places where it is necessary to transport machinery and stores over roadless country many miles from the railway.

The difficulties presented by the working conditions are such that the author cannot regard any one of the existing systems as perfect, and expects that much will be done to improve the vehicles in the near future.

There is probably room for considerable improvement in the chain track itself as well as in its supports and its antifriction devices. The variation in resistance to haulage is so great as between one system and another, not merely in static resistance to starting, but in dynamic resistance to haulage, that, as already suggested, the various track systems should form the subject of comparative tests at some of the great agricultural colleges.

One feature that is particularly remarkable is the small amount of power lost in compressing soft marshy land under the feet of the track chains. A very visible alteration of the appearance of a marshy surface due to the prints made by the track-feet may, for example, only involve an expenditure of power which is but slightly greater than that required for hard ground, whereas the effort involved in walking over the same soft surface may be many times greater than that of walking on the hard road.

### Historical Note

The use of multiple-wheel traction for road tractors appears to have made its appearance in practical form almost simultaneously in France and Holland about 1903; in the latter country as the Spyker passenger car, and in the former as the Renard road train. The idea of the road train was taken up by the Daimler Company of Coventry, in 1907, and trains on this principle, embodying considerable improvements on the original French design, were tested in India. Apart from trials on comparatively flat country near Bombay, other and very severe trials were made on the Gauhati-Shillong road at the instance of the Indian State Railway. This road, which is about 64 miles in total length, with about 7 miles level and a rise of nearly 5000 ft. in the remainder accompanied by the sharp curves and steep pitches of an ordinary cart road, was subsequently worked on the block system with single vehicles. The abandonment of the Renard train does not, however, appear to have been due to any failure to meet the conditions of traction.

The vehicles of the Renard train were connected for traction by a coupling-bar which insured the steering of the trailing vehicles; the power was transmitted from the locomotor by a cardan shaft, with a sliding joint in the coupling section to permit of relative rise and fall of the vehicles.

There does not appear to have been either provision for compensating for varying velocities of the wheels of different vehicles, which could occur even with wheels of equal diameter on uneven surfaces, or provision of automatic locking devices for the differentials in case any driving wheel failed to grip. In such event the drive was taken by the other vehicles, but neither of the driving wheels of the vehicle in question could assist in traction under such circumstances.

### Invention of the Differential Gear

It is worth noting that, in Young's work, published in 1860, is mentioned that a quarter-scale model made by Mr. Burstall of London, in 1827, and tested at Edinburgh, where it ran 250 miles in eight days, was arranged with a differential gear similar to that fitted to a steam coach by Rufus Porter, of Hartford, Conn., about 1830. The date of Burstall's model is therefore earlier than the date of Roberts' invention previously given by the author in a paper on the Development of Road Locomotion in Recent Years. According to Young, the mitre-gear arrangement of differential also appears in the subsequent American carriage of James about 1834. From this it would seem that the idea of the application of the balanced differential gear to traction originated in Britain, but was first applied to full-size machines in the United States.

Difficulties with the bevel or spur forms of differential drive are familiar to all car drivers who have had experience with chain drives, particularly the difficulty caused by the fracture of a chain, which prevents driving except by the alternative of locking a sprocket and driving the other through the differential gear, with resultant doubling of the speed of the corresponding road wheel. To overcome this difficulty Hedgeland, of America, produced a solid axle with cone-clutch inside the wheel hubs, internally threaded, and carried on screwed portions of each end of the back axle.

The locking of one or other of these clutches with the corresponding wheel hub permitted driving; overrunning of the wheel unscrewed the clutch and freed the wheel. The work was consequently all thrown on to the inner wheel, or, if the wheels were of unequal diameter, on the straight the larger wheel alone became the driver; furthermore, if the brakes were applied or other change made in the drive, causing engagement of either or both of the clutches, appreciable shock resulted. It will be seen that with the Hedgeland axle the car would be driven by either back wheel on the straight at a speed corresponding to the normal mean revolutions which would be obtained with the ordinary type of differential, but that on a curve it would be driven faster than the normal.

This class of differential is therefore not a true differential in the sense that it does not divide the power; but it is an arrangement equivalent to free-wheeling either road wheel in advance of the propelling gear. Several forms of cam and roller (derivatives of the Bourdon clutch) or eccentric gears have been devised for the same object, all of which are merely mechanical variants of the free wheel.

Yet another form of differential is the eccentric and connecting-rod type, in which each axle end is formed with two eccentrics with throws at right angles, and short connecting-rods attached to these having gudgeon-pins common to each pair and sliding in slots in the differential casing. Thus in the illustration the short connecting-rods *L* and *H* are attached to the pin *E*, the other pair *J* and *K* being attached to the pin *I*. It will be seen that the gear forms a balance gear the mechanical efficiency of which is reduced by friction in the eccentrics.

### Trouble With the Ordinary Differential

The subject has been dealt with very thoroughly under the title Differential Substitutes in a paper read by Mr. D. D. Ormsby, before the Society of Automobile Engineers (America), in June, 1916. Mr. Ormsby points out that the trouble found with the ordinary differential is due to its being too efficient, and that it is possible to reduce the reversibility of the gear to any desired extent by using suitably designed worm gears.

It was claimed for the Hedgeland gear that a car fitted with it was less liable to side-slip; the same claim is made for the worm differential gear, but the advantage of the worm differential, which has secured its adoption in one or other of its forms on the majority of four-wheel driven cars intended for use on bad roads or land, is the elimination of difficulty with mud holes and ice patches.

The earliest chain-track invention of which any record has been traced by the author is that of Richard Lovell Edgeworth of 1770. In his description the inventor states that this "consists in making portable railways to wheel carriages, so that several pieces of wood are connected to the carriage, which it moves in regular succession in such manner that a sufficient length of railway is constantly at rest for the wheels to roll upon, and that when the wheels have nearly approached the extremity of this part of the railway their motion shall lay down a fresh length of rail in front, the weight of which in its descent shall assist in raising such part of the rail as the wheels have already passed over, and thus the pieces of wood which are taken up in the rear are in succession laid in the front, so as to furnish constantly a railway for the wheels to roll upon." If the word metal is substituted for wood, this description applies to the majority of the types of vehicles described in this paper.

### Tracklayer Invention

The next step is the invention of Thomas German in 1801, who placed a chain of rollers carried by linkworth between a

(*Continued on page* 733)

# Motoring in France After 3½ Years of War

By W. F. Bradley

*Special Correspondent of* AUTOMOTIVE INDUSTRIES *in Paris*

PARIS, March 1—The gasoline shortage in France is so acute that not a drop must be wasted, and as a result France has cut out private motoring with a cut so clean and sharp that there are some thousands of private owners whose cars are as useless to them as if they were minus cylinders or wheels. The ordinary man, no matter what his means, is unable to purchase any kind of fuel fit to put into an automobile tank. As a further precaution, and in order to prevent supplies getting into unauthorized hands, police and military are stationed at various points around the city of Paris with authority to stop all cars, whether private or military, and inquire into the business of those aboard.

It is wonderful testimony to the utility of the automobile that despite these severe regulations the number of automobiles on the streets is so great that strangers have difficulty in believing that conditions are not normal. It is recognized, for instance, that the State cannot afford to allow an important engineer, a works manager or a leading official to waste time walking or waiting for trolley cars to the detriment of war work. The army has to supply such men with gasoline, and it considers that provision just as important as the supplying of an artillery tractor or an ammunition truck. In a country where the only industry is that of war it is sometimes difficult to determine who is not entitled to use an automobile. The general rule, therefore, is that the connection with war industries must be direct before a gasoline allowance can be made, and having given an allowance steps must be taken to prevent the fuel being used for illegitimate purposes. With this latter object in view, travel passes have been instituted; these define the district in which the car can be operated, and any person found outside that district is liable to prosecution.

### Military Authorities Control All Fuel

Gasoline is the only fuel available, and the whole of this is in the hands of the military authorities, who distribute it as they consider fit. Coal gas, which is being made use of to a certain extent in England, is not obtainable in France. Benzol and alcohol, which were considerably used before the war, particularly on trucks, have been requisitioned for the making of explosives, not a drop being purchasable for any purpose by private individuals.

All the motor activity of Paris and district is military or of a semi-military character. While Allied armies are kept as far away from the city as possible, there is an amazing variety of cars belonging to the American, British, Italian, Portuguese and French armies, giving Paris a cosmopolitan air it never enjoyed even in peace times. There is plenty of variety about the automobile vehicles, for they pass through the whole scale from the Ford, the powerful staff car, heavy Quartermaster trucks, aviation fast trucks and trailers, trucks towing aeroplane fuselages on their own wheels, heavy French four-wheel-drive tractors hauling big guns on special automobile type gun carriages, and miscellaneous ambulances.

Officially Paris is not in the war zone, and its inhabitants smile at the suggestion of the Germans, who are only seventy miles away, getting within range of the city; nevertheless the war dominates everything and forces itself upon attention at every moment. There exists the most varied selection of uniforms the world has ever seen; the railroad depots are filled with the soldiers of every Allied nation, and there is enough aerial activity to make the newly arrived stranger realize that he is living next door to the war zone. Most of the airplanes flying over the city are the Paris guard which patrol the air just as the policeman down below patrols his area. Others are new machines being delivered from the factory to the military flying ground or passing from one military aviation ground to another. Just outside the city, above the ground used for motorcar testing since the beginning of the French automobile industry, airplanes are now being tested in such numbers that it is no common sight to see thirty machines aloft at once.

### Aerial Travel Behind the Front

Naturally all flying is of military nature, but much of the aerial travel is disconnected with actual fighting. It is common, for instance, for officers of the various armies to make visits to distant parts of the fronts by means of airplanes. There is a considerable aerial traffic between Paris and London, while England sends all her machines into France by the aerial way. This is the only way some very big span planes can be delivered, for it is impossible to pass the wings through tunnels and under bridges. Up to the present only military or Government officials make trips by aeroplane between Paris and London, but some leading manufacturers working for the army and having business connections with the two cities are anxious to be allowed to make use of the air service between the two centers. There is no logical reason why an airplane manufacturer in Paris, who also has works in some part of England, should not fly over with one of his machines, thus accomplishing in three hours a journey which occupies from 18 to 24 by railroad and steamer. If this has not been done except in very special circumstances, it is because of the police and military regulations which surround all traveling and the fear, on the part of the authorities, that if a civilian flying service were instituted there would be

*Five-ton Pierce-Arrow truck used by City of Paris, with its woman driver*

no control over the travelers. It is certain, however, that busy army contractors will not wait until the end of the war in order to obtain this necessary time saving measure.

Before the war Parisians relied about equally on motorbuses, electric surface lines and subway lines for communication. For nearly three years the city was without a single one of its normal fleet of 1000 motorbuses. At the present time there are only two lines of motorbuses in service, the fleet being not more than thirty strong. It has been impossible to put a greater number into service partly owing to the shortage of fuel, but more largely on account of the difficulty of manufacturing more vehicles. The omnibus company having a monopoly of the Paris service produces practically all its own vehicles, the chassis being assembled from components obtained from the various automobile factories, and the bodies being built entirely in the shops of the omnibus company. Since the war the production of motorbuses by the bus company has been intensified, but instead of the vehicles going on the streets of the city they are taken by the military authorities and sent to the front, where they are used for the rapid transportation of troops and for the delivery of fresh meat. It was only because they were able to get ahead of their production program that the company was allowed to put the present thirty buses into city service. Although operating costs have considerably increased since the war, fares have remained the same, the company being under a contract with the city of Paris to run their buses at certain fixed fares, which cannot be modified without permission during the period of the contract.

**Taxicabs Few in Paris**

Paris taxicabs have decreased in number from 8000 before the war to about 3000. Before the war the rate of fares applied by 75 per cent of the Paris taxicabs was 30 cents per mile; about 25 per cent ran at 15 cents a mile and the remainder at 40 cents a mile. At the present time no cabs are operating at less than 40 cents a mile. All these cabs are two-cylinder models built before the war, in very poor mechanical condition, and generally driven by men of little experience.

Before the war France possessed 160,000 motor vehicles, exclusive of motorcycles. Of this number 115,000 were touring cars. At least 80 per cent of these touring cars have either been requisitioned by the military authorities or are lying idle. There are no definite figures on the number of trucks in service; immediately on the outbreak of war their numbers dropped considerably, but during the last twelve months there has been a considerable increase made necessary by the urgency of transport and the loss of horses and mules, the former having decreased in number 31 per cent and the latter 14 per cent, between 1913 and 1916. Since this latter year the decrease has continued on an important scale. It is certain that as soon as the home factories can supply or importations are allowed there will be an unprecedented increase in the number of automobile trucks in private service in France.

Owing to the lowered means of transportation many public bodies have been obliged to call on the army from time to time for truckage. On more than one occasion army trucks have had to respond to an all-night hurry call in order to distribute to the bakeries the flour required for the next day's bread supply. Because of the loss of horses and the consequent inability of getting private contractors to undertake haulage, the Paris municipality has purchased and put into service 100 Pierce-Arrow 5-ton trucks and 100 Fiat 3 1-2 ton trucks. These are used for distributing flour, coal, wood and general food supplies and also for the collection of household refuse at times when the electric truck service is not adequate.

One of the greatest difficulties the Paris authorities have had to contend with since putting these trucks into service has been the supply of competent drivers. An appeal was made to the army authorities for some of the older men to be released from the automobile service, but without result. It was impossible to get together more than a dozen men having had experience as truck drivers, and even these were all men who had been discharged as unfit for further service in the army. Consequently the municipality decided to make use of its own employees and to train women. A school was formed, the pupils first of all being given instruction on light trucks rented from the army; after a little experience on these the women were put on motor street sweepers, then finally given a Pierce-Arrow or a Fiat. It was predicted that the result of training women as truck drivers would be disastrous, but by careful selection and by taking only women who have been used to heavy physical work all their lives fairly satisfactory results have been obtained. Now the most serious difficulty is not in obtaining drivers but in getting competent mechanics for the maintenance of the trucks.

In addition to making use of these trucks for purely municipal service, the Paris authorities rent them out to contractors and others whenever they can be spared. The cost to the municipality is calculated at $9.40 per day for a 5-ton Pierce-Arrow, plus 28 cents for every kilometer run. The 3 1-2 ton Fiats cost $8.40 per day, plus 22 cents per kilometer. To these prices a profit of 15 per cent is added for the benefit of the municipality.

Apart from the Paris municipality women drivers have not been employed to any extent in the French services. There are no cases of private firms using women chauffeurs. The army has officially admitted women to drive light trucks, touring cars and ambulances, but the experiment has not been a great success, and the fact that a man is nearly always attached to the car at the same time, in order to crank it, wash it, and attend to it mechanically, makes the change one of very doubtful economy.

Attempts have been made by the army to employ Asiatic troops as truck drivers with very unsatisfactory results. After a long training in the army schools the inefficiency of these men was revealed by an accident list 50 per cent greater than that shown by the worst European drivers. It was after this experience, and still with a view to economy of labor, that women were admitted to drive army cars.

Ninety per cent of the automobile stores of Paris are closed or have been loaned to charitable institutions. The few that are open show pre-war cars or chassis, but nobody is left in attendance to answer queries if any should be made.

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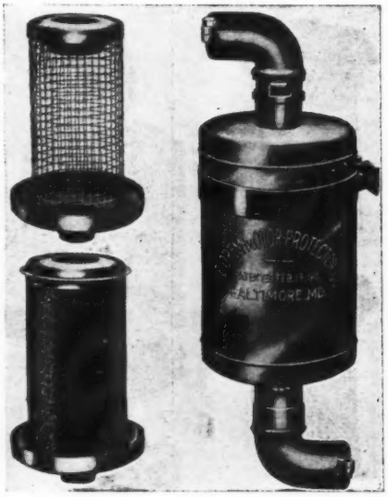
# Orem Motor Protector

A DUST separator for use on tractor and other engines has been placed on the market by the Orem Motor Protector Co., Baltimore, Md. Illustrations of the complete device and of its component parts are shown herewith.

The air, whether heated or unheated, enters at the top, first striking a deep cup at the top of the cage. Any heavy particles of grit drop into the cup of their own weight. The air is then drawn down around the cage and filtered through a prepared felt filter which has a surface area of 84 sq in. The filtering material is not woven, but consists of pressed felt which is claimed to have the best possible straining qualities obtainable with a given obstruction to the passage of the air entering the inside chamber. Owing to the vibration of the motor all of the dust particles are shaken off the filter surface into the bottom dust collecting ring. The filter felt can be renewed at small cost. Motor block tests are said to have shown that the filter does not reduce the engine power by wire drawing of the air.



*The Orem motor protector* ***in parts and complete***

# Domestic Chrome Ores Again in Demand

## Low-Quality Ores Hitherto Unworked Now Worth Refining

THE war has increased so greatly the demand for chrome steel for use in making armor plate, projectiles and high-speed tools that the domestic production was multiplied almost eighty-fold between 1914 and 1916.

From the beginning of the chrome industry until the Civil War the mines of chrome ore in Maryland and Pennsylvania were practically the only sources of supply for the entire world. Up to the latter part of the nineteenth century almost all these mines were owned or operated by the Tyson Mining Co., Baltimore. When the importation of Turkish ores lowered the prices of chrome ore in the United States market, home production was reduced, and the Pennsylvania deposits of the ore were consequently relegated to the position of a reserve supply.

### Imports Doubled in Two Years

Since the Eastern mines were closed in 1882, or thereabouts, says the *Iron Trade Review*, the chrome ore produced in the United States has been mined almost entirely from deposits on the Pacific coast, and the output has been declining, while the imports from foreign sources, chiefly from South Africa and New Caledonia, have been steadily rising.

The imports in 1916 were almost double those in 1914. The reports of the United States Geological Survey show that the domestic production in 1916 was 47,035 tons and that the imports were 115,945 tons, so that the total available supply in 1916 was 162,980 tons. In 1917 the domestic production was only about 40,000 tons, and the imports, computed from reports for the first nine months of the year, fell to 103,000 tons. The total quantity of chrome ore available for consumption in 1917 was therefore only 143,000 tons, as contrasted with 162,980 tons available in 1916.

In November, 1917, E. F. Bliss of the United States Geological Survey examined the chrome-bearing rocks of the state-line serpentine belt of southern Pennsylvania and discovered deposits of chromite occurring from Bald Friar, on the Susquehanna River, through the southern part of Lancaster and Chester counties, Pa., and the northern part of Cecil County, Md. The ore occurs both as massive, compact chromite in nodules and pockets of variable size in a serpentine gangue, and as a spotted ore in which grains of chromite are rather evenly distributed through the serpentine. The pockets that contain the massive ore are so irregularly distributed that prospecting is largely a matter of chance, but in view of the theory recently advanced that chromite is formed through segregation, by gravity or otherwise, along the bottom or sides of an igneous intrusive mass, it is of high practical significance to the prospectors to note that most of the Pennsylvania deposits lie along the north edge of an apparently southward-pitching mass of serpentine. Four of the old mines are situated on the actual contact of serpentine and crystalline schists.

### Abandoned Mines Reopened

Nine abandoned mines on or near the serpentine boundary were examined. These mines extend for a distance of 9 miles eastward. Four of the shafts disclose massive ore. Specimens of ore assayed 56 per cent of chromic oxide and averaged 48 per cent. The remaining five mines and one old pit in an isolated area of serpentine show disseminated or spotted ore, known among the chrome miners of that region as bird's-eye. In the prosperous days of the eastern chrome industry this ore was apparently not considered sufficiently valuable to repay the cost of concentration, because the massive ore could easily be cobbed and hand-sorted, the product being of sufficiently good quality to meet the demands of that period. Now that the country is certain to be short of chrome ore, which is urgently needed to supply the large demands of an industry that has become vital, the question of concentrating low-grade ores assumes new importance.

At several old mines there appears to be a fair grade of concentrating ore. Estimates of the quantity of ore available are difficult to make, owing to the lack of other than surface indication, but the facts that at one mine about 2000 tons of spotted ore are lying on the dumps and that rock taken a few feet below the surface at a point about a mile and a half east of the mine contains spotted ore of the same character, indicate that a considerable quantity of similar ore may lie below the surface.

Analyses of average samples from the dumps mentioned above show 33.27 to 34.27 per cent by weight of chromite in the ore. An analysis of the chromite recovered by concentration from the samples shows 48.79 per cent of iron and alumina and 51.21 per cent of chromic oxide. The ore, which is nonmagnetic, occurs in black grains of brilliant luster. The gangue is a massive green serpentine that contains little or no asbestos, a fact that is of practical interest, for the presence of considerable asbestos in chrome ore makes concentration more difficult. Fragments of massive chromite found in the dumps indicate that nodules of massive ore, in addition to the spotted ore, are distributed through the serpentine. The nearest railway shipping point is less than two miles distant and is accessible by good roads.

Inasmuch as an ore that runs 33 per cent by weight of chromite contains about one part of chromite to two parts of waste, 3 tons of this spotted ore should contain 1 ton of chromite. About 60 per cent of the chromite content of such ores can be recovered, so that after proper allowance for losses in treatment, 5 tons of this ore should yield 1 ton of chromite.

In view of the facts stated concerning the geologic relations of the chromite deposits in this region and of the favorable market for the ore, the possibility of discovering and exploiting new deposits in southern Pennsylvania, as well as the practicability of working over some of the old mine dumps, should receive the attention of mining men who are interested in supplementing our inadequate domestic supply of chromite.

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## Growth of National Laboratory

IN a recent lecture before the Royal Society Sir Richard T. Glazebrook, director of the National Physical Laboratory, said that in 1901, the year of foundation, the staff of that institution consisted of three scientific assistants working in some small rooms at the Kew Observatory, and the old observatory staff; the income was perhaps £5,000. From April 1 next the laboratory will be organized in eight different departments, each with its own superintendent and a large staff of scientific assistants and observers. The staff now numbers well over 500 persons, of whom about 180 are women. The expenditure during the current financial year will be considerably above £100,000. Quite recently several acres of ground adjoining the laboratory were secured and large additional buildings are being erected; these are required for urgent war work.

Many of these have been erected by private generosity. Thus, Sir A. F. Yarrow gave £20,000 for the William Froude National Tank, Sir Julius Wernher erected the Metallurgical Laboratory at the cost of £10,000, Sir John Brunner gave £5,000 to the Electrical Laboratory, while many friends—including the Royal Commissioners of the Exhibition of 1851—contributed to the administration block and the Optical Laboratory erected in 1913 at a cost of £20,000.

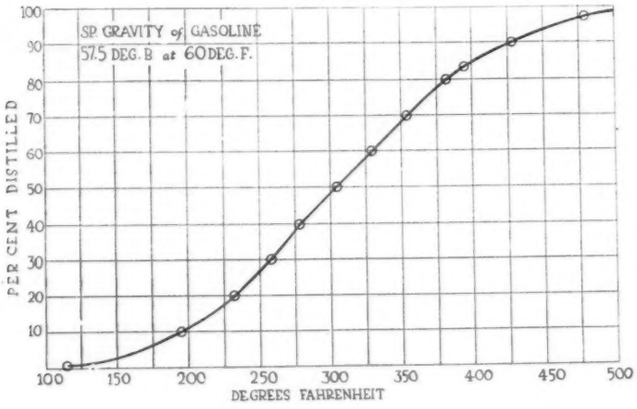
# Combustible Mixtures Should Be Dry

## Exhaust Heat Supplied to the Fuel Should Be Sufficient Only to Vaporize It—Mixture Must Not Be Superheated

By J. Edward Schipper

IT HAS been practically universally recognized that dryness is the one essential quality of the intake manifold. With a dry manifold the problems of crankcase dilution disappear, as well as those of acceleration after cold starting, and with proper arrangements good volumetric efficiency can be secured.

For some time past there has been a wide-spread belief that it is necessary to maintain a high velocity in the intake manifold in order to secure suitable combustion. However, a careful analysis of the problem seems to indicate that high velocity is not always associated with the best possible conditions for combustion in the cylinder. It may be conceded that with a wet mixture entering the cylinders it is necessary to have a high velocity in order to get even fairly satisfactory action.




*Distillation curve of commercial gasoline*

On the other hand, it has been maintained by engineers who have specialized on this particular problem that a dry manifold can be of almost any desired size; it can be made large with advantage to the power output of the engine at high speed, and without disadvantage at low speed. With the fuels which we are now using there is only one way in which we can secure a dry manifold, and that is by the utilization of exhaust heat. It is impossible to secure a dry manifold with a water-jacketed intake for the simple reason that the water-jacket temperature is not above the boiling point of the fuels which we are now compelled to use.

In arranging for the utilization of the exhaust heat, the shape of the manifold is of the highest importance. In order to keep up the volumetric efficiency the fuel should be raised only to its boiling point and no further. Each molecule of the fuel should have passed into the vaporous condition, and when it has reached this condition, any more heat added simply cuts down the volumetric efficiency. It, therefore, is an incorrect practice to attempt to heat the entire charge of fuel to the end point temperature. What should be done is to take the fuel which is vaporized at atmospheric temperature and handle it at that temperature. The remaining fuel should be held until heated to its own boiling temperature, after which it should be released and diluted with the proper amount of air.

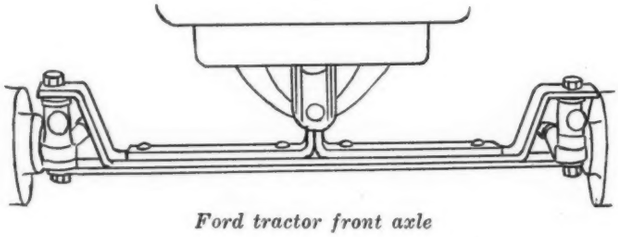
Studies of fuel treated in this manner indicate that condensation is not to be feared, for the reason that the action of the diluting air is such as to spread the molecules to such an extent that they cannot find each other in the time required to enter the combustion chamber. Thus, although the temperature of the mixture may drop to a point below what was originally the boiling point of a large percentage of the fuel, the molecules do not find each other rapidly enough to effect the combination which is necessary to condensation. Therefore, if condensation occurs at all, it is only in a very limited part of the volume.

### Effect of Wall Temperatures

The claim has been made in recent articles on this subject that when a dry mixture is used, the performance of an engine is quite independent of combustion chamber wall temperatures below 212 deg. Fahr. This would not appear to be true when the laws of heat flow are considered. The rapidity with which heat is extracted from the combustion chamber by the cooling water depends on the difference in temperature between the interior and exterior of the cylinder. It is quite certain that a greater amount of heat is drawn through the cylinder walls when the water is below running temperature than when it is at proper operating temperature, and, therefore, the thermal efficiency is lower, owing to the increased loss to the jackets.

It would therefore appear that a manifold of the hot-spot type should have this heated area so designed that the heat is applied to that part of the charge which requires it for vaporization, while the remaining part which has already been vaporized before reaching the hot-spot should never touch this heated portion.

Furthermore, the particles of fuel which do come in contact with the hot-spot should absorb from this heated area only a sufficient amount of heat to raise them to just above the boiling temperature, after which they should be immediately diluted by the introduction of air and carried along to the combustion chamber.



*Ford tractor front axle*

# A New System of Truck Springing

## Special Volute Springs Provided for Absorbing Horizontal Shocks—Radius Rods and Torque Bar Used

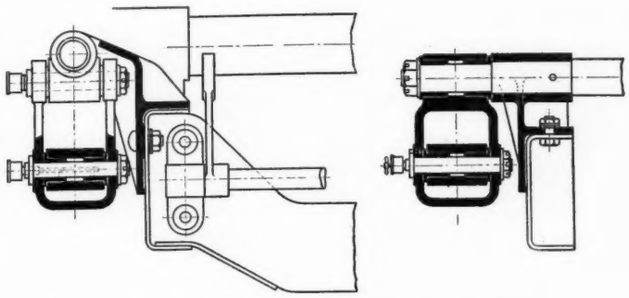
IN one of our recent issues we described a new system of springing designed to take up the horizontal shocks on a chassis. With the same idea in view a special system of truck springing has been developed by G. E. D. Ralls, managing director of the Birmingham & Midland Counties Transport Co., Ltd., Birmingham, England. Mr. Ralls has had very extensive experience in motor work with a great variety of makes, and he believes that his new system of springing will eliminate one of the important sources of trouble with commercial vehicles.

In American practice the aim has been of late to relieve shocks due to striking road obstacles by using the Hotchkiss drive and dispensing with torque bars and radius rods. Mr. Ralls's design makes use of both of these members. It is obvious that the ordinary semi-elliptic truck springs, which frequently are made quite flat, have very little capacity for absorbing horizontal shocks. When radius rods are used the rear axle is almost rigidly tied to the frame, and any shocks to the rear axle are transmitted to the frame. That this has been realized before is shown by the fact that some trucks have been built with radius rods carrying a volute spring at the forward end, where it is joined to the frame.

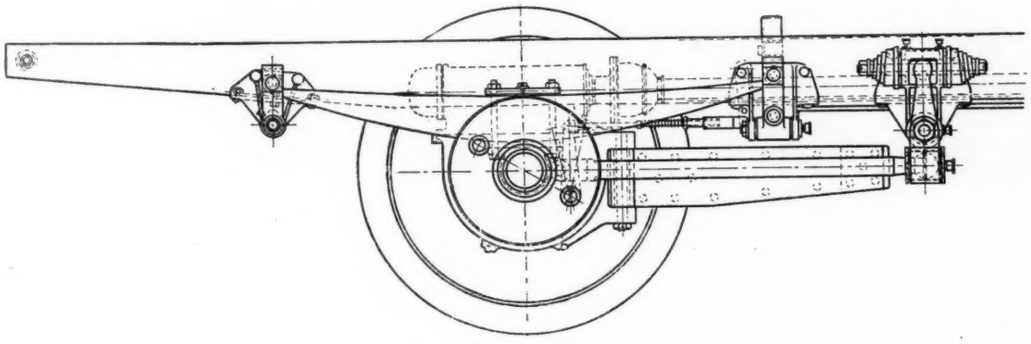
### Ralls System

In the Ralls system the rear springs are mounted on the outside of the axle housing, on which they are free to run. The springs are shackled at both ends, and the shackles are supported on pivots, which allow freedom of movement endwise. Thus the work of the semi-elliptic spring is confined to taking up vertical shocks. Torque reaction is taken up by a built-up torque arm, which is connected with the rear axle housing by a pivot joint and is provided at its forward end with a ball which is supported in a socket carried on a cross member of the main frame. The torque rod being pivoted to the rear axle housing, it does not restrain the axle from moving sideways nor from moving up and down; the only motion it restrains is angular motion around the axle. Two radius rods are used and are connected at their rear end to the two spring brackets respectively. At their forward ends they are provided with forged balls, which are carried in sockets on two arm levers. These levers are arranged vertically and are keyed to a common cross shaft, and the upper ends are each held between two powerful volute springs. It is these latter springs which absorb the horizontal shock. A similar arrangement is used in connection with the forward springs. In addition there are provided means for taking care of unusually heavy blows. Formed integral with the vertical lever is a cam, and when the spring receives a very heavy blow this cam bears on the top of the spring at a point a few inches forward of the rear shackle. The effect of this is to reduce the effective length of the spring, and therefore to stiffen it and so make it able to withstand greater shocks.

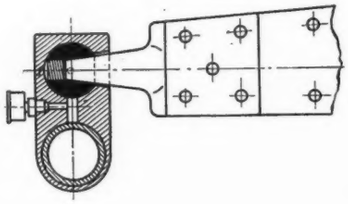
This springing system is said to have a very marked effect on the riding qualities of the truck, which is said to have a steady, even motion when proceeding over the roads with a load, and there is also said to be an entire absence of shock when the clutch is let in. This, of course, tends to protect the whole driving mechanism.



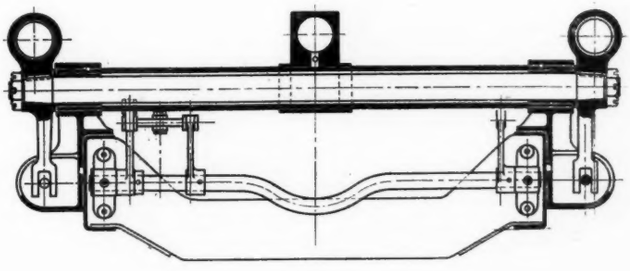
*Shackles at both ends of rear springs*



*Rear end of truck, showing arrangement of springs, torque arm and radius rod*



*Forward connection of torque arm*



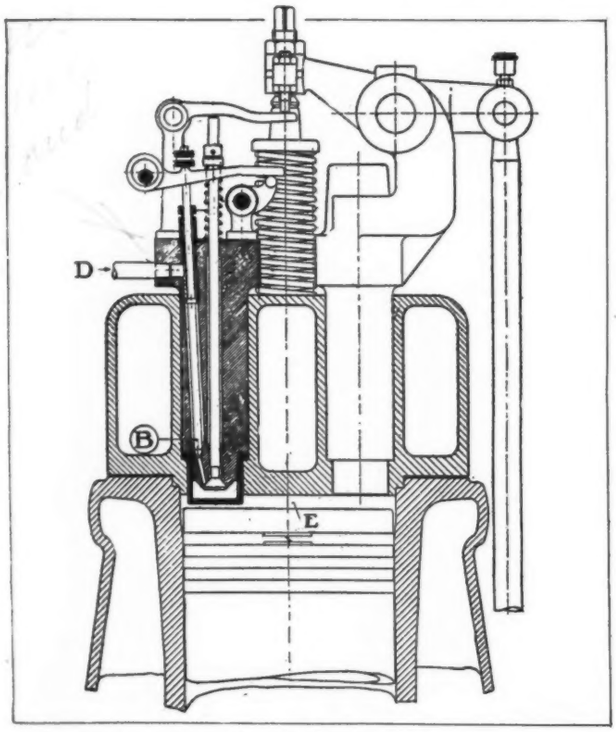
# A New Heavy Fuel Engine—The Hvid

## Starts from Cold Without Preheating, Is Self-Igniting and Can Be Built in Small Powers

FOR large engines, undoubtedly the best principle on which to burn heavy fuels is that of the Diesel engine, because not only does this engine dispense with the carbureter and ignition apparatus, and the troubles inherent therein, but it also operates at comparatively high efficiency with a small load. Unfortunately, it is practically impossible to build a Diesel engine in small sizes, for the reason that the fuel feeding apparatus, which is in the form of a pump, would have to be of exceedingly minute dimensions, and would be hard to keep tight.

To overcome this limitation of the Diesel cycle to large powers, a new engine, known as the Hvid, has recently been brought out abroad, and manufacturing licenses under the patents on same have been taken out by a dozen manufacturers in this country. The only difference between the Diesel cycle and Hvid cycle is that in the latter the liquid fuel does not have to be forced into the cylinder at the moment of maximum compression. This dispenses with the small pump working against a very high pressure and thus eliminates one of the most delicate parts of the Diesel engine.

In the Hvid engine compression is carried at between 450 and 470 lbs. per sq. in. The engine is of the four-cycle type, air being drawn into the cylinder during the first stroke, and is compressed during the next upward stroke. At the same time that air is being drawn into the cylinder through the inlet valve, liquid fuel is admitted by a mechanically operated valve *B* into the cup *D*, which is supported in the cylinder head. There are a number of outlets from this cup into the combustion chamber, which are located at a slight distance above the bottom of the cup, and the size of which varies with the size of the engine. The amount of liquid fuel which is admitted to the cylinder at each suction stroke may be regulated by means of a needle valve *B*.




*Section through Hvid cylinder showing fuel feed device*

### Fuel Injected by Explosion Pressure

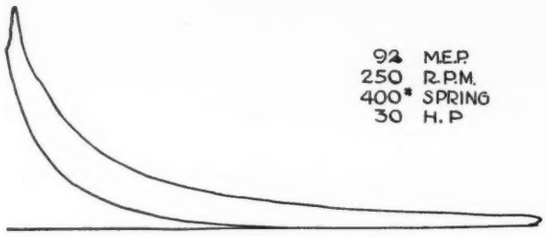
During the compression stroke, the air within the compression space is, of course, raised to a very high temperature, and this temperature is communicated to the fuel cup and to the liquid fuel within it. The fuel itself occupies only a small amount of space within the cup, and there is always some air within the latter. After the fuel becomes heated by the increasing compression, part of it becomes vaporized and the vapor mixes with the air in the cup. Toward the end of the compression stroke a temperature is reached which is sufficient to cause the gaseous mixture within the fuel cup to explode, and the pressure thus produced, which is estimated at about 800 lb. per sq. in., causes the gas and liquid fuel to be ejected from the opening in the fuel cup into the combustion chamber. It is, of course, the more volatile part of the fuel that is vaporized first and mixes with the air in the fuel cup. Since there is enough fuel in the fuel cup to combine with all the air in the combustion chamber, the amount of fuel which passes into the gaseous stage during the compression stroke is only small, and practically all of the fuel is ejected from the fuel cup in a liquid state. As it leaves the orifices in the walls of the fuel cup it burns in substantially the same manner as in a Diesel engine.

Injection of the fuel into the highly compressed volume of air causes only a slight increase in pressure within the combustion chamber. This is due chiefly to the fact that fuel is forced into the combustion chamber gradually, and the pressure is maintained as long as fuel continues to be added. From that point on the expansion is along the same line as in an ordinary gas engine. During the final stroke the exhaust takes place.

The same as the Diesel engine, the Hvid requires no ignition apparatus and no carbureter. Speed regulation is effected by acting on the needle valve *B*. In some designs this is provided with a coarse screw and carries an arm which can be connected to a governor. Thus, when the speed increases and the governor balls move farther apart, the effect will be to turn the needle valve farther into its seat and thus reduce the amount of fuel supplied the engine.

### Constant Compression

What tends to keep up the efficiency of this engine at small load is that no matter how small the load may be, the same amount of air is always taken into the cylinder. Hence, the compression in invariable. It is the low compression at small loads which makes a four-cycle engine so inefficient, especially in automobile service, where the greater part of the work is below half load.




*Indicator diagram from a Hvid engine (reduced from original)*

Not the least advantage of this engine is the simple arrangement of the fuel system. As already stated, there is no carbureter, and all that is required is to place a fuel tank at a point somewhat higher than the head of the engine and connect it by piping directly to the fuel valves. Where the fuel tank has to be placed low for any reason, a pump may be used to supply an auxiliary tank in an elevated position and provided with an overflow. There are no joints in the fuel system under high pressure, which is an advantage not to be undervalued.

There is no difficulty in using fuels of comparatively low volatility. In fact, the only requirement is that they be sufficiently mobile so as to readily flow through the fuel valve. The Hvid motor is said to have an advantage over the Diesel in regard to speed possibilities. In the Diesel the action of the high pressure spray air expanding from about 1000 lb. per sq. in. to the cylinder pressure of 500 lb. tends to cool the atomized oil and to delay its ignition. In the Hvid motor, on the contrary, the oil spray by reason of the explosion in the fuel cup is intensely hot. It is claimed that for the same reason the Hvid engine is more flexible, and instances are cited of an engine running at speeds of 160 and 1600 r.p.m.

Trouble might be anticipated from the fact that the fuel cup is subjected to the heat of combustion within the cylinder, but cups removed from the engine immediately after long runs do not show the color that one would expect after they had reached a high temperature. The engine does not depend on any hot surface for combustion—only the heat generated by the compression—and, therefore, can be started from cold instantly. We understand that the Hvid engine has been built in sizes as small as 2 hp.

For the indicator diagrams and some of the information in this article we are indebted to the Sears-Roebuck Co., Chicago, who are one of the licensees under the Hvid patents.

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## Traction on Bad Roads or Land

(*Continued from page* 726)

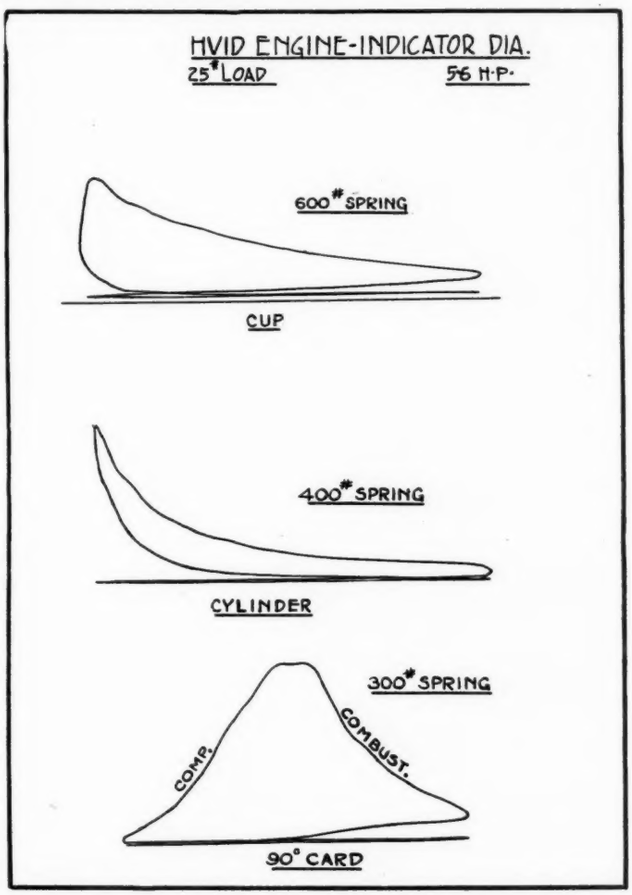
runner, or sledge frame, carried on the vehicle, and the ground. The system, modified by the interposition of a chain track resting on the ground, also has its modern analogues, of which the Log-Hauler and Centiped are the more important. The idea was revived in slightly different form by William Palmer in 1812, and subsequently by Richard Barry in 1821.

In 1825 Sir George Cayley proposed a revolving railway with "the several links or parts . . . connected to each other by joints so formed as to limit the angular movement of any two of the said links relatively with each other by a stop." The form of construction shown in this inventor's drawings closely resembles that adopted on some of the earlier modern attempts to obtain a practical track-laying tractor; and, as has been shown, the chain proposed by him, with its limitation of angular movement, would have been subject to some of the disadvantages that retarded the recent development of this type of tractor in Britain.

The various attempts that were made to produce tractors in which the weight was distributed over a chain of rails or plates failed to evolve any practical device for nearly seventy years, when the less ambitious scheme, invented by Boydell in 1846, of a track-laying wheel, somewhat similar to the girdle wheels now in use for hauling heavy loads over soft land, was carried out in constructional form and actually subjected to severe tests on bad roads about 1858 to 1860. In this tractor the sections or feet were attached to the wheel by links.

Another system, making even less pretense to improvement in load distribution, was the Thomson loose rubber band creeping between the wheel center and the track of tire shoes. In the earliest form the shoes were designed as a continuous chain girdle and later consisted of independent shoes. Road locomotives so fitted were adopted for the traction of road trains on the Grand Trunk road in India under the direction of Colonel R. E. B. Crompton. The system had an active life or several years in the early seventies. The engines weighed about 9 tons, and hauled some 16 tons of load without undue road wear. The expense of maintaining the rubber tires under these conditions was as low as 1.5d. per mile run. The invention constituted the first practical attempt to reduce the unsprung weight of the vehicle to that of the tire shoes alone.

In the latter half of the nineteenth century but few attempts to revive track-laying tractors appear to have been made. At the Royal Agricultural Society's show, held at Kilburn in August, 1879, two vehicles were exhibited by W. C. Pellat of Clerkenwell. These were fitted with self-laying continuous tracks of flat plates secured to chains; the jointing of the successive links was thus of the most primitive character with practically point contact between the chain links. The resultant wear would be sufficient to account for the failure of these vehicles to attain success, although they again demonstrated the advantages of the chain track for transport over soft ground.




*Indicator diagram showing pressure in cup and in combustion chamber of Hvid engine (reduced from original)*

# Staggered Door Sedan

## Suggested Design for Fall Delivery, with Good Vision for Driver—Details of Pillar Design—Equipment and Finishings

By George T. Mercer

At this time of the year, when work on closed-car bodies for fall delivery is getting under way, and the question of design is being definitely settled, the method used by the best manufacturers to determine the style is to combine the best new features exhibited at the shows held at the first of the year with the experience and demands that the salesmen have had during the past selling season.

One of the things that have come to the top as a salesman's point is the location of the doors on inside-drive cars. The use of the body with the aisle between the front seats has opened up possibilities for locating the doors that were never thought of before. Formerly it went without saying that there must be a separate entrance for both the rear and front seats, but the aisle between the seats has made it practical to have two in place of four doors, thus not only a saving in production, but permitting of lighter pillar construction above the belt molding.

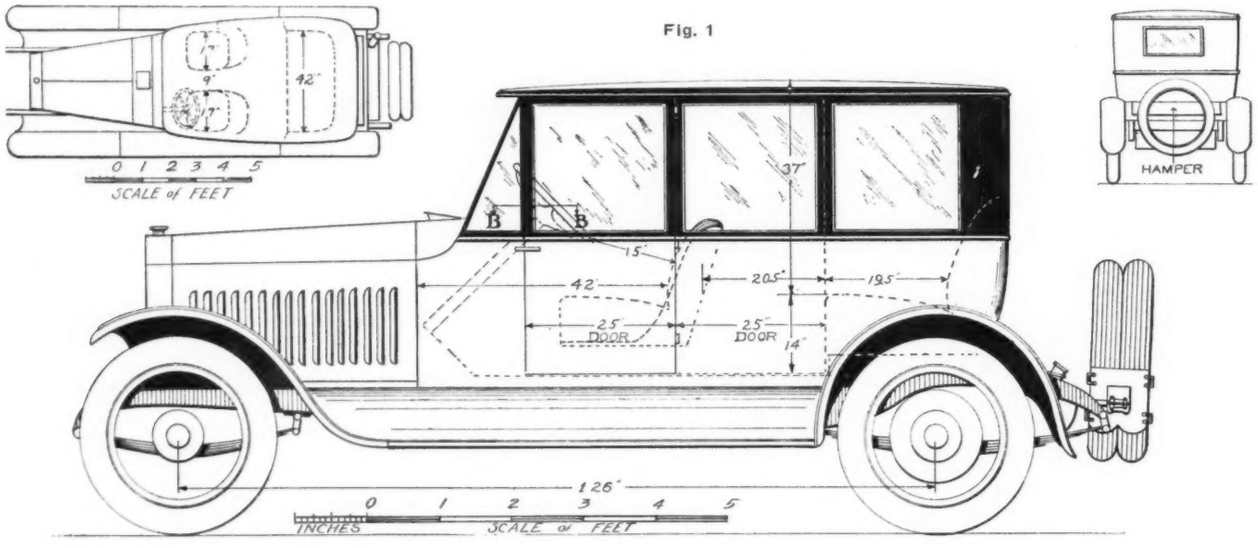
With the design Fig. 1 as an example, the designer would naturally, for the sake of balance, put the doors, if two were to be used, in the middle, one in each side and directly opposite. This is an ideal method from a construction viewpoint and also permits the front upright of the triangular glass to be very light and unobtrusive, but the salesman has found that the majority of the public objects to the middle entrance because of crowding the occupants of the rear seat when passing in and out at the back of the front seat. If extra folding seats are added, the middle entrance is out of the question, therefore on the large bodies with extra seats four doors are used and on the smaller bodies, as Fig. 1, offset or staggered doors are used, the two-door idea being retained, but the left one placed forward for the driver and the right door located in the middle.

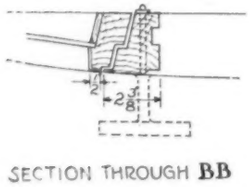
The chief objection to the forward door is that it increases the thickness of the pillar at *B-B*, because it is necessary to have two pillars when a door is used, one on the door and one on the body.

*A-A* Fig. 2 shows how it is customary to do this. This is thicker than on Fig. 1 and the two cross sections on Fig. 2, *A-A* and *B-B*, give in inches the exact size of the two and show the gain in reduction to be 1 inch, which is a substantial amount of pillar size to be dispensed with.

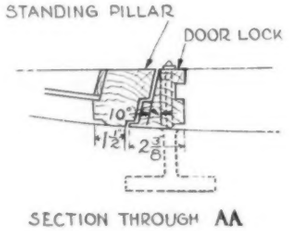
The reason that the two sections, *A-A* and *B-B*, are

Fig. 1



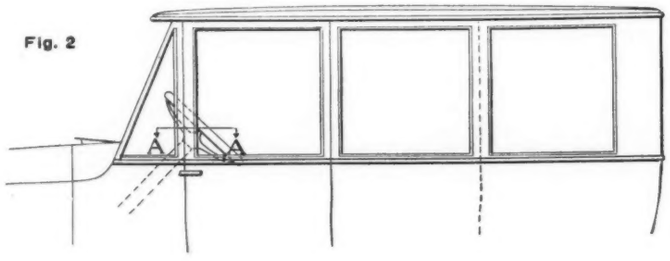




SECTION THROUGH BB




SECTION THROUGH AA

Fig. 2



drawn is to show the necessity of making the door pillar so large. It is not generally understood that the front of the door has a bevel of 10 deg. in order to clear when opening and closing. This bevel takes from the size of the pillar on the inside, and although it is 2⅜ in. on the outside, there is only enough room for the handle to clear the runway for the glass. It is one of the most objectionable things to have a thick pillar at *B-B*, but if a door must be made at this place, the necessity of making the standing pillar lighter than usual, as shown in Fig. 2, is so evident that the design, Fig. 1, will need no argument to substantiate itself.

To better understand the cross-section, *A-A* and *B-B*, the words, "standing pillar," refer to the stationary pillar against which the door shuts. "Door-lock pillar" is the front door framing post.

The illustration Fig. 1 is a close-coupled body of sensible proportions for four passengers. This size body seems to be the one most in demand at the present time, due to the need of economizing in fuel and tires, the dimensions given are such as will guarantee the maximum of comfort and the aisle between the seats is sufficient for practical use if required.

### Form of Molding

On this body the wide belt molding extends entirely around, as does also the drip molding at the roof. This may seem like going back to old custom; it has the advantage, however, of being simple construction, as it permits of butting the upper and lower panels and covering the joint with the molding. The cowl at the front is assembled in the same way and the upper rear panel finishes under the drip molding; this permits of using a wood roof and covering with canvas and painting, this canvas also being tied under the drip. The construction method is simple and looks well, as the design attests. The roof line shows thin; the upper that is white on the design will not be visible to the eye.

The front windshield has an angle of 19 deg. and the glass is divided as customary, the lower part stationary and the upper a single glass that swings outward. The most practical fastening is a piano hinge at the top and side arms to hold the glass in the desired extended position. The posts are cast bronze ¾ in. thick on the sides and 1⅛ in. on the front. The channel for the lower glass is cast integrally with the post. A separate cross member, which is also a casting, forms the rest of the frame between the side posts. These latter are one piece with the base or belt and the upright, which forms the outer surface for the standing pillar; that is the triangular window frame is one casting and is so made because it is more practical to fasten in position when made in this way. The glass of the triangle is put in from the inside and secured by finish molding.

### Fittings and Attachments

The door hinges are of the outside curved pattern, as this permits of using lighter pillars, and the doors are flush without moldings or overlap. The ventilation is from the top, and side ventilators are not used to any extent as they convey the hot air from the louvres into the body.

At the rear is a small hamper extension to cover the chassis frame, and this, as shown on the rear view, Fig. 1, is low and inconspicuous from the side, being on a line just below top of the guards and occupying all the space between. The hamper arrangement has been a troublesome matter to adjust, and no design has ever been made that compares with the illustration for one of small size. If the hamper is large as on a runabout, this design is not possible, but for a body occupying nearly all the chassis the design as illustrated is the best. There is a door on the top for utilizing the space inside.

This body can be made either of sheet metal or aluminum. The latter is preferable for custom work. The belt molding is 1⅛ in. wide and flat, as this corresponds best with the straight effect of the present plan in designing. Straight bar handles are used on the doors to a large extent for the same reason.

The plan and rear views and the dimensions will amply clarify all questions as to the proportions and appearance of the body from all angles, and to avoid any misunderstanding, Figs. 1 and 2 are the same, except that front pillars marked *AA* and *BB*, Fig. 2, are merely used to show how this pillar is customarily made in thickness and to illustrate the comparative improvement when this pillar is made lighter as on Fig. 1.

The front triangular glass is stationary, but the other side glasses all drop flush. The rear seat is narrower than usual on this account, but it will be possible to have this seat wider by having the glass drop only to the top of the wheel house. Regulators are used for the middle windows, but straps are used for the front and rear on account of interference at the sitting position.

Interior finish, appointments and color design vary to conform to individual taste more than ever; even stock bodies are changed to better satisfy the customer. In a body like that illustrated there is a tendency to curtail the appointments more than formerly, as many of the inside-drive bodies are made convertible and these latter have from the beginning been made very plain; curtains will be used on the middle and rear quarter and back lights with silk to match the trimming, which should be gray with black pin stripes and the design to be pleats. The appointments will consist of corner reading lights, silver finish and concealed vanity cases and the clock to be on the instrument board, silvered pull handles on the middle door and one step light for same.

The favorite color at present is blue that approaches a green or gray shade for the lower part and black upper panels and guards.

## Book Review

"American Lubricants," by L. C. Lockhart; 6 x 9 in., 236 pages. Illustrated. Published by the Chemical Publishing Co., Easton, Pa. Price, $2.

Owing to the important part which lubrication plays in the operation of practically all machinery and especially of internal combustion engines, there is quite a demand for reliable information regarding the properties of different lubricants. There has long been a demand for a good hand book on the subject, and we have no doubt that Mr. Lockhart's book will fill this demand satisfactorily. It must not be understood that the book is devoted solely to a consideration of the lubricating problems of automotive machinery. Lubricants are used for a wide variety of purposes, and the field covered by the book is a very extensive one.

In the opening chapter the author deals with crude petroleum, its history, its composition, its field production and transportation. The next chapter takes up refining of petroleum, describing the different products of the distillation process. In the following chapter the author goes at greater length into the properties of the various distillates. A chapter is devoted to the subject of friction and lubrication, and there are chapters on the lubrication of various classes of machinery, including gas engines, automobiles, electrical machinery, steam railways, cotton and other textile mills and miscellaneous plants and machines. There is one chapter on physical tests of lubricating oils and another on chemical tests.

In addition to the mineral lubricating oils the author also discusses the different kinds of vegetable oils used for lubricating purposes, as well as greases and solid lubricants. The last part of the book contains numerous specifications of different lubricants issued by Government departments and by large industrial and railroad organizations.

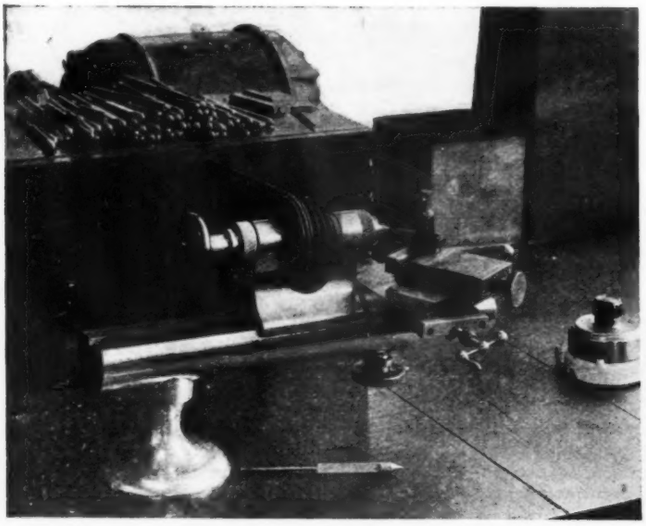
# Monel Metal as Carbureter Needle Valve Material

## Characteristics of Nickel-Copper Alloy Used Extensively for This Purpose—Comparison with Other Materials

By J. Edward Schipper

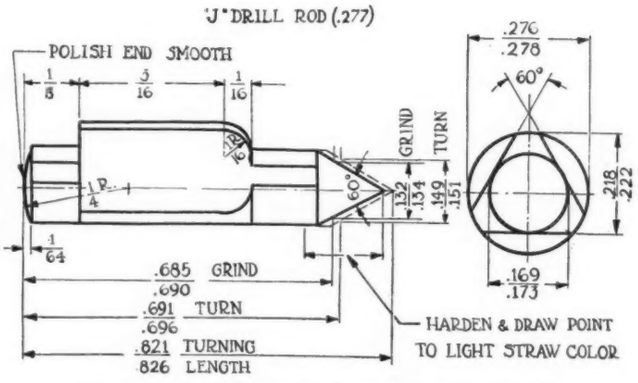
MONEL metal, a natural alloy of nickel and copper, has been in use for carbureter needle valves for two years or more with satisfactory results. Nevertheless, difficulties are encountered with it by concerns which are just beginning to use it on account of its somewhat difficult machining characteristics. The advantages of the metal are its toughness, durability and highly non-corrosive features. It maintains its smoothness and polish for an exceptionally long time, and for this reason is very desirable in an instrument in which the quality of uniform and unimpeded flow is essential.

An analysis of the reported experiences seems to show that while troubles do appear from time to time in connection with the machining, the situation is similar to that of steel, where occasionally a bad run is encountered. It is also commonly believed that difficulties due to irregularity in composition occur more frequently with monel metal than with other materials. The effect as described by one manufacturer is "comparable with cases of steels where seams or slag pockets are encountered." On the whole we have not met one carbureter manufacturer who does not believe that the material is highly satisfactory.



*Type of jeweler's lathe used at Zenith Carbureter Co. on monel metal needles*

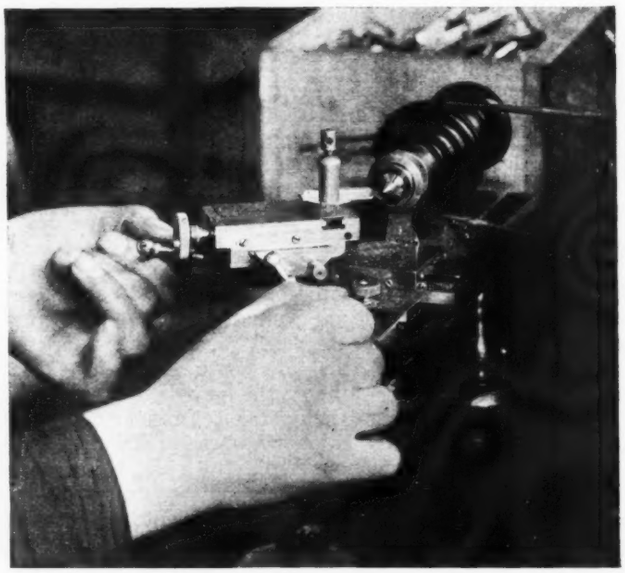
Monel metal runs from 60 to 70 per cent nickel and generally around 28 per cent copper. It is capable of being forged, soldered, brazed and welded and can be had in cold-drawn rods and wire; cold-rolled strips, hot-rolled rods and sheets, wire screen and filter cloth tubing. An idea of the price as compared with other metals can be gathered from the following table:




*Float needle valve made from drill rod, showing operations and dimensions*

| Material. | Price Per Lb. |
|---|---|
| Phosphor bronze | $1.00 to $1.10 |
| Thirty per cent nickel steel | .75 to .85 |
| Commercially pure nickel | 1.15 to 1.25 |
| Monel metal | .60 to .70 |

The prices given in this tabulation are for ⅛ and 3/16-in. round rod, delivered from the mill. The deliveries on all this material are very slow at the present time, and it is not infrequent that purchasing agents



*Set-up on jeweler's lathe for turning point on monel metal needle valve used in Zenith carbureter*

SIDE GUIDE & GRIPPER

have orders in for all types of metal suitable for the needle valves to avert risk of stopping production on account of lack of material for this vital part. All these metals are used for manufacturing needle valve points, and, in addition, drill rod which has been put through rust-proofing processes is also authorized by carbureter manufacturers. One of the concerns making drill rod coated in a manner satisfactory for needle points is the Simmons Company, Kenosha, Wis. The Holley company has used these points with success.

Some of the interesting physical qualities of monel metal are given in the following tabulation:

Melting point.....1360 deg. Cent. (2480 deg. Fahr.)
Specific gravity (cast).8.87
Weight per cubic in.
(cast) .....0.319 lb.
Weight per cubic in.
(rolled) .....0.323 lb.
Coefficient of expansion,
20 to 100 deg. Cent.
per 1 deg. Cent.....0.00001375
Electrical conductivity.4 per cent of that of copper
Electrical resistivity..256 ohms per mill-foot.
(Temperature coefficient 0.0011 per 1 deg. Fahr.)
Heat conductivity.....1/15 that of copper
Modulus of elasticity..23,000,000

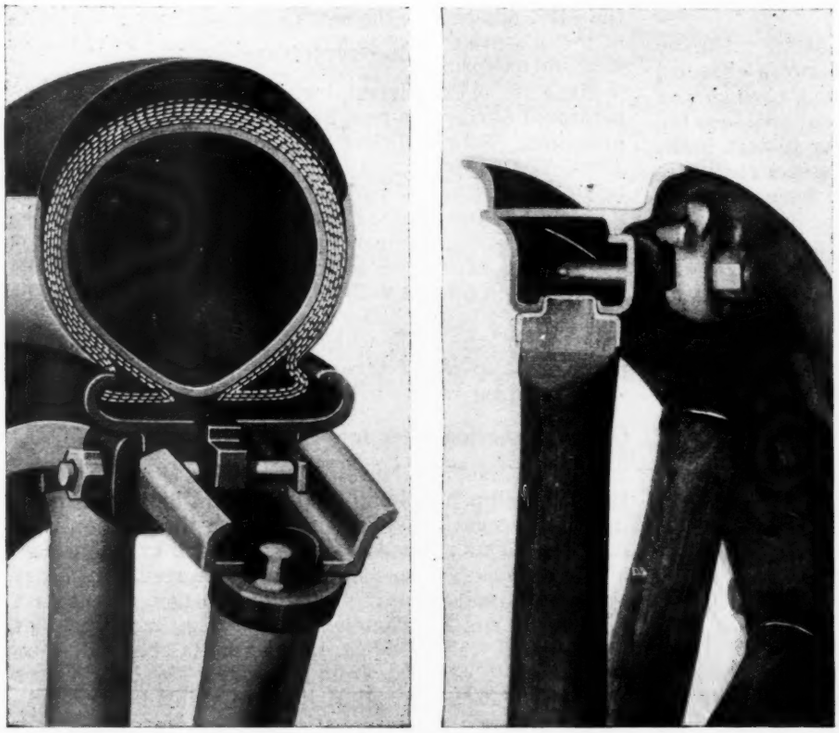
Little steel is being used for needle valves for floats. Holley is furnishing one customer with carbureters so equipped. The steel point used in this carbureter is shown in the drawing herewith. It is made of drill rod completely machined, with the point turned. It is then hardened and tempered to a light straw color. The point is then ground to obtain the necessary smooth conical surface concentric with the body. It is necessary that the grinding be smooth and accurate, as an out-of-round condition or a slight scratch will necessarily result in a leak.

At the plant of the Zenith Carbureter Company the work on the monel metal needles is handled in a jeweler's lathe. The accompanying illustrations show the set-up for this work, which is handled by a woman. Considerable care has to be taken on this part, but the fine cut taken by this type of lathe solves the problem nicely.

# Kelsey Wheel with Metal Felloe Saves Hickory

THE Kelsey Wheel Co. of Detroit has brought out a wheel with a metal felloe band in place of the usual wood type. The advantages resulting from this method of construction are that it obviates the consumption of wood of a kind which is difficult to obtain at the present time and that it gives a wheel which is equal in strength and resiliency to the usual wood wheel at a lower cost.

For some time the Kelsey Co., which furnishes manufacturers of passenger cars in and around Detroit with approximately 500,000 sets of wheels annually, has had its engineers working on this problem. Up to this time the company has used a wood felloe band construction with the connection between the spoke and the felloe reinforced by a flange clip. This fastening device, known as the "flanged over edge" type, has been used to strengthen the wood felloe and maintain the rigidity of the wheel. The new construction gives a wheel for which the same service is claimed, as well as saving half the wood formerly required.



*On left—Structural view of new Kelsey wheel with metal felloe band for 30 x 3½ size only. It will be noted that this differs from the larger size in that the box-shaped felloe is supplanted by an open form. On right—Structural view of new Kelsey wheel with metal felloe band. This construction is used for size 32 x 3½ and over*

In the Kelsey construction a steel felloe is used which is of endless channel shape section, extensible and in a single piece. On each spoke is placed a stamped steel ferrule, which protects the spoke when going into the felloe, giving a weather-proof and check-proof joint. The wood spokes and ferrule are forced into the steel felloe under hydraulic pressure. They are turned true to size and mitered, both at the flange and the hub, and arranged in staggered relation. When glued, the spokes are forced under heavy pressure radially outward in a tenanting socket of the endless steel felloe by opposite pressure applied at the center of the wheel. This gives a high degree of tensioning and a permanent assemblage of the wheel. Although bolts are used in the hub, these are not depended upon to hold the spokes in place, as the tensioning mentioned is more than sufficient to take care of this. Tests on a wheel with 1¼ in. spokes (corresponding to a tire size of 30 x 3½ in.) have shown it to be capable of supporting a radial load of 2000 lbs.

The Kelsey Co. has been developing this type of wheel for four years, and placed several sets of them among manufacturers for trial. The results obtained have led to the adoption of the type as a standard stock product and they are now being produced in quantities.

SIDE GUIDE & GRIPPER

# Ignition Temperature of Gaseous Mixtures

## Definition of Ignition Temperature—How It Is Affected by the Manner in Which the Temperature Is Attained—Pressure of the Gases and the Materials with Which the Gases Are in Contact

By P. M. Heldt*

THE question is often asked, What is the lowest temperature at which a mixture of gasoline vapor and air or of kerosene vapor and air will ignite? Various answers have been given and there seems to be considerable discrepancy between them. This is not at all surprising in view of the great number of variables involved. In the first place, neither gasoline nor kerosene is a definite chemical compound. Each is a mixture of several similar compounds, but the proportions of the constituents are by no means fixed. Secondly, ignition depends not only on temperature, but also upon the compression of the mixture. Thirdly, the proportion of fuel to air has quite an influence on the incendivity of the mixture, and under this heading it may be remarked that two mixtures of the same proportional amount of fuel and air are not equally ignitable if they are not uniform throughout.

### Definition of Ignition

We must also make clear exactly what we mean by ignition. A distinction must be made between chemical combination which sometimes is a luminous phenomenon and ignition in the proper sense. Take for instance the case of hydrogen and oxygen. According to text books these can be kept together in a closed vessel for years without combining to any degree, if the temperature is kept low. On the other hand, a mixture of hydrogen and chlorine, which will remain apparently inert as long as it is kept in the dark, will immediately explode if it is subjected to strong light. This has been explained on the theory that in order to effect the explosion it is necessary to break up the molecules of the fuel into their atoms. The chemical reaction is accelerated by heat (among other agencies), and at 300 deg. C. there is already a notable combination of hydrogen and oxygen, while at 500 deg. C. the reaction becomes rapid. At some point above this latter temperature regular explosion takes place, and it is, of course, this temperature which is referred to when the explosion temperature is spoken of. It will be seen from this discussion that what is called the ignition temperature is a somewhat vague term.

### Chemical Combination Accelerated by Heat

The combination of the gases begins at a certain temperature and is accelerated as the temperature increases. The final results of the reaction, both chemically and as regards the total heat of combustion, are the same whether the combustion takes place slowly or rapidly, but, of course, the maximum temperature is much greater if combustion is rapid.

A definition of ignition temperature has been formulated by Prof. H. B. Dixon. He says that the ignition temperature is that temperature to which the gases must separately be heated so as to immediately inflame when brought into contact with one another. While this definition seems a sound one it does not fit every case of practical work. For instance, in an internal combustion engine the gaseous mixture is usually of a comparatively low pressure and only a small portion of it is raised to the ignition temperature by means of the electric spark. It is very likely that the total heat of the spark, or what is generally referred to as the volume of this spark, has an effect upon its capacity for causing ignition. Ignition of course depends upon the composition of the mixture that is raised in temperature. The magneto spark between the points of the spark plug will only affect a very small portion of the mixture, and if it then happens to be not of the proper proportion ignition may fail. On the other hand, a powerful spark will cause a violent agitation of the gases adjacent to the spark point and may reach parts of the mixture or may so stir up the mixture as to render it more uniform.

Much of the experimental work regarding ignition temperatures during the past half century has been done on hydrogen. Four different methods have been employed. Thus, Victor Meyer and his associates used a bulb containing a mixture of hydrogen and oxygen and plunged it into a bath maintained at a constant temperature. The observed ignition temperatures ranged from 518 to 608 deg. It has been objected to in Meyer's method that the gases were in contact with one another and with the walls of the vessel before being heated and that the gas pressure within the bulb, which originally was one atmosphere, rose to about three atmospheres while the bulb was immersed in the hot bath.

### Catalytic Action a Factor

A second method consists in passing the gaseous mixture through a tube lying within the hot bath, thus heating them up until they gradually reach the ignition temperature. This method has been employed by a considerable number of experimenters, and the results also are greatly at variance, ranging from 550 deg. in the case of Mallard and Le Chatelier to 845 deg. in the case of Gautier and Helier. Most of the results obtained, however, are not very far from 700 deg. The high values obtained by Gautier and Helier are pointed to as indicating a strong catalytic action, as these experimenters packed their tubes with pieces of porcelain and other materials. Catalytic action is generally defined as the influence upon chemical reactions of materials which are not changed thereby. Probably the molecules of the fuel and air are drawn by capillary action into the pores of

the catalyst, and by reason of the fineness of these pores are brought into such close proximity as to combine chemically.

Mark, at the suggestion of Nernst, made a series of experiments in which the temperature of the gaseous mixture was varied by compression and was determined by calculation instead of by measurement. Ignition occurred at pressures ranging from 35 atmospheres to 70 atmospheres, corresponding to temperatures of 508 to 569 deg. C. As ignition took place under high compression, the results are not comparable with those obtained by the other methods.

The latest series of experiments on hydrogen ignition temperatures was carried out by H. B. Dixon and H. F. Coward. A special apparatus was used, consisting of two connecting vertical tubes, of which the outer one, of porcelain and bound on the outside with platinum foil, serves as an electric furnace, while the inner one, a glass tube, reaches up to the middle of the furnace, where it ends in a small orifice. Hydrogen enters at this orifice, in which there is located a thermocouple, and mixes with the oxygen passing up the outer tube. The gases are therefore of the highest temperature at the very moment when they are brought in contact with each other. The average of all observations taken by Dixon and Coward for the ignition temperature was 585 deg. Centigrade, and this temperature was the same whether hydrogen was mixed with oxygen or with atmospheric air. A remarkable thing in connection with the results obtained by Dixon and Coward is that, while the average of all observations was very close to the lowest temperature at which ignition was obtained, there were wide fluctuations on the other side. In some instances ignition did not take place until temperatures of 800 deg. were reached.

These variations were obtained by a change in the relative rates of flow, and consequently in the proportion of gases, and also by a change in the size of the nozzle and of the tube and nozzle materials. For the latter various glasses, rough and glazed porcelain and quartz were used. The highest temperature was observed at the slowest rate of hydrogen flow. As the gas pressure was raised, the ignition temperature decreased.

Experiments by all of the four methods above described have also been made with other combustible gases, including carbon monoxide, ethane, acetylene, ammonia and hydrogen sulphide. With most of these the fluctuations in the ignition temperature were less than in the case of the hydrogen-oxygen mixture, but the range of the experiments was generally also less extensive. It seems to make very little difference whether air or pure oxygen is used. There is practically no difference in the ignition temperature of a hydrogen-oxygen mixture and a hydrogen-air mixture.

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## Reasons for Propeller Shaft Brake

ENGINEERS considering future designs may be interested in knowing the reasons which led one automobile manufacturer to adopt the propeller shaft brake for his coming model. A study of the reasons given indicates clearly that in the opinion of this manufacturer this type of brake would not be suitable for service work. As a hand-brake proposition, however, it would work out well. The reasons follow:

1. We believe the transmission brake should be operated as an emergency brake only, so it will be used only in case of emergency or in locking the car at the curb. If used as a service brake it is constantly subjecting to strain both the propeller shaft and the rear axle, and tends to produce undue wear on both of these parts. If used as an emergency brake only, as a general rule it causes little or no damage to the propeller shaft and rear axle.

2. It simplifies and cheapens the chassis construction and does away with numerous rods and shafts which tend to whip and rattle.

3. It is exceptionally easy to operate, inasmuch as the braking effort is multiplied through the rear axle.

4. It requires a very small throw of the handbrake lever to apply and, therefore, requires only a small cut-out in the floor board.

5. Owing to the simplified construction, the chassis weight is somewhat reduced.

6. It impresses an equal braking effort on both rear wheels and tends to reduce skidding.

7. Owing to its position the propeller shaft brake is not so liable as the rear wheel brake to become coated with grease.

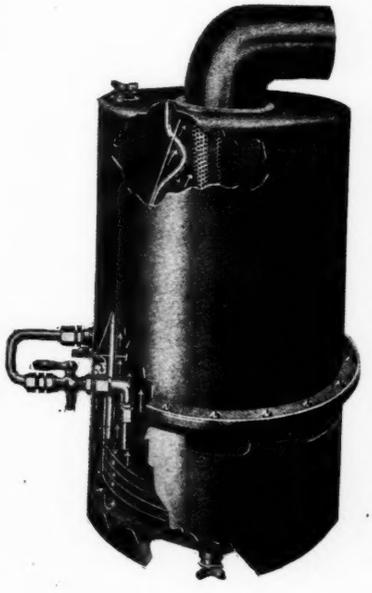
—

## Leonard Air Washer

A NEW design of air cleaner, which at the same time moistens the air entering the carbureter, is being marketed by the Leonard Air Washer Co., Kalamazoo, Mich. It is the design of Mr. Leonard, who is also responsible for the Duplex Four Wheel Drive truck and the Leonard tractor.

The Leonard air washer consists of a cylindrical metal chamber made up of two drawn steel cups with flanges at their open ends by which they are bolted together. There is a conical partition in the upper part of this chamber, which makes the outer part of the upper cup into a water tank. This can be filled through a filling hole in the head. Within the lower cup there is a concentric sheet metal cylinder, which extends to near the bottom of the cup. At the lower end of this interior sheet metal cylinder there are a number of superposed discs of perforated metal. There is a pipe connection between the water tank and what may be called the washing space, and a valve is inserted in this pipe connection to permit of shutting off communication between the water space and the washing space. The end of the water pipe is bent downward and ends directly above the uppermost plate. There is also a vent pipe inside the washing chamber, the lower end of which is substantially on a level with the end of the water pipe.

When the engine is operating, air is drawn into the lower cup through eight oblong openings equally distributed over the circumference. This air passes downward between the wall of the lower cup and the sheet metal cylinder within, and up through the perforated plates and the water in the bottom of the lower cup. Continuing upward in the washing space, it is drawn through a funnel of perforated metal which tends to separate any small globules of water, and it leaves the washer through the elbow fitting on top. The water level in the lower cup is maintained constant and is determined by the height of the lower end of the water pipe and the vent pipe. As soon as the ends of these two pipes are uncovered, water will flow from the tank to the lower part.



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THE AUTOMOBILE

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# New Equipment for Land Warfare

IN the great battle in Picardy, trench fighting has been at least temporarily abandoned, and the opposing armies are again struggling in the open field. The indications are that there will be a great deal of this kind of fighting the coming summer, and it will bring with it new developments in the technical equipment of land warfare, particularly in tanks. Tanks will undoubtedly be enlarged so as to make it possible for them to cross wide trenches, such as those of the Hindenburg line, without the necessity of stopping and building a sort of bridge work, an operation which is expensive both in lives and material. Along with the increase in size will come heavier armor protection, to render the tanks proof against shells from the smaller size field guns.

This heaviest type of tank must of necessity be a slow and rather unwieldy machine, and one that can be used effectively only under certain conditions. It will, therefore, be supplemented by other types which are both lighter and speedier, and there will probably be a complete line from the heavy land cruiser above referred to to the armored automobile carrying a machine gun, which was used to some extent during the first few months of the war. This latter machine is particularly effective in manouvers involving rapid movement, both pursuit and retreat. The Germans are reported to have used three types of tanks in the Picardy battle, one consisting of rebuilt captured British tanks; another being a German design, shorter, faster and more heavily protected than the British, and the third, a heavy German design tank, 45 ft. long, with an armament comprising a 3-in. cannon, machine guns and a flame thrower.

The development of tanks or land cruisers is assuming an importance little if any short of that of aircraft, and it is quite possible that before the end of the year tank production will loom very much larger in our industrial activities than it does now. The fact that the type of tank most suitable for offensive operations varies with the topography of the country and the rate of movement of the troops calls for the production of a variety of machines and necessitates a large program.

# Accessibility in Tractors

PROBABLY the history of development of all mechanical devices is a good deal alike. At first the aim of inventors and engineers is to produce a machine that will accomplish a certain object. As the machine is put to practical work, difficulties will arise, usually in considerable number, and these will be eliminated one after another. One thing that is usually lost sight of during the early stage of development is that parts of the machine which will wear out or break should not be so located that when they fail it becomes necessary to tear the whole machine apart to get at them. There were plenty instances of this kind in early automobile history. We have in mind particularly a certain light runabout with single-cylinder horizontal engine and a planetary transmission on the engine shaft. A central single chain drive was used and the sprocket pinion, which was of soft steel and had a very small number of teeth, was located between the engine and the transmission so that when it required renewal, which was quite frequently, the labor cost of getting the old sprocket out and the new one in was about ten times as great as the cost of the part.

Happily, in automobile design we have passed beyond this state of affairs. Parts having only a short life are practically unknown in the better grade of automobile and those that require occasional renewal are so placed that it is not necessary to disturb many other parts before they can be replaced.

Easy renewal of parts is a much more important feature in a farm tractor than in a passenger automobile. While tractors lend themselves to many uses they are generally worked hardest during the spring and fall plowing seasons. These are very busy times on the farm and it is readily imaginable that an interruption in the work of the tractor due to the breakage or wear of some trivial part that can only be gotten at by taking practically the whole machine to pieces is calculated to greatly irritate the owner.

Before the tractor can fully establish its place as an indispensable farm machine such defects must be eliminated. We are quite aware that this cannot be done immediately, that the solution of the problem is not as easy as its statement. For, besides accessibility of wearing parts we need compactness, fairly light weight and the highest possible working efficiency. Tractor designers are still struggling with the major problems of their particular field. They are not yet agreed on the relative positions of the various chief components of the tractor, on the type of final drive and on various other important questions. Often accessibility is sacrificed in order to obtain the most compact arrangement of parts possible and thus to produce a tractor which has a light drawbar pull in relation to weight and shows up well in other respects. But no tractor which requires a great deal of dismantling in order to reach parts that require more or less frequent attention will satisfy the user and be able to establish a name for itself in the market. Therefore, the designer should always keep before him the various possibilities of trouble and should try to provide means of remedying these with as little expense and loss of time as possible.

# Make It an Over-Subscription

A BIG over-subscription by the United States of the third Liberty Loan will be the greatest blow that this country can give to Germany. The fact that all of the wealth and man-power stands behind this nation's interests in the war is of far greater military value than any number of 70-mile cannons. The one sensitive spot in the armor of the enemy is his knowledge that the world is against him. Nothing will show this fact more clearly than the subscription by the people of this nation to the Liberty Loan in greater strength than ever before.

If you have organized a Liberty Loan drive at your factory do not suspend your efforts now. Keep it up until the last day. Make 100 per cent quota your aim and when you have attained this 100 per cent start over again and increase the subscription of those who have not contributed to their fullest extent.

President Wilson has said that this will be the decisive year of the war. Nothing will make this decision more strongly felt than the determination of this country with 100,000,000 civilized people to see it through to its finish.

### Must Impress Our Determination on Germany

We have finished our first year of war and it has been largely a year of preparation. The second year will be a year of deeds and the deeds will be greater and more important as they are backed by the riches of the country. The fact that this is a democratic war cannot be more strongly evidenced than by the fact that the contributions which maintain this country's forces at the front come not from the rich alone but from the masses as well.

Let us show Germany that we are in this war to a finish. Not only are we sending our men across in increasing numbers but our money is back of them from the millions of the capitalists to the quarters of the news-boys.

Though the third Liberty Loan drive has only been initiated, it is quickly rolling up a total which far surpasses the predictions of the most optimistic. Because this holds true in the beginning, do not let it influence you in your determination to keep up the drive until the last day. If 60 per cent, 80 per cent or 90 per cent of the men in your organization have bought Liberty bonds, do not be content until the last 40, 20 or 10 per cent have also contributed.

### No Apologies Necessary

You need not offer any apologies when you ask a man to buy Liberty bonds. You are not taking money away from him, but you are storing it up for him, and at the same time you are making it available for the use of the Government in a cause which must be seen through to the bitter end. We are fighting a foe who is lashed to his efforts by the knout of the tyrant. To this we must oppose the more intelligent firmness and the healthy strength of the lover of liberty.

Throw all of your resources into this third Liberty Loan and make it a personal success. You have only to answer to yourself to do this.

# Road Illumination

PERHAPS as difficult a problem to deal with on an exact basis as any which has ever confronted illuminating engineers is that of proper road illumination for automobiles at night. The tests held in New York City last week and briefly reported in our issue of April 4 show to what an extent individual judgment varies as regards the intensity of illumination necessary to make a person in dark clothing visible on a dark night, and also as to the permissible glare from the headlamps of oncoming vehicles. In connection with each of the items which it was sought to determine the limiting values bore a ratio of 10 to 1 or more. In part, no doubt, these enormous differences in the results obtained are due to differences in eyesight, but it seems reasonable to suppose that differences in judgment played an even greater part.

### Definite Intensity of Illumination

If anti-glare laws are to be justly enforced it may be necessary to fix some definite intensity of illumination which must not be exceeded. But the difficulties that will be encountered are indicated by the fact that the average headlamp candlepower which was considered tolerable from the standpoint of glare at a distance of 100 ft. was only 7.5 per cent of that required by the average driver to see a man in dark clothing at a distance of 150 ft. As the illumination varies inversely as the square of the distance, the permissible candlepower, from the standpoint of glare at 100 ft., would make the man visible only at 41 ft. Now a car proceeding at 20 m.p.h. can be stopped in about 40 ft. under normal conditions, but some time must necessarily elapse before the brakes can be fully applied, and to make driving at night safe a more intense illumination is essential.

# □ Latest News of the

## Aircraft Heads New Priority List

### Automobiles Not Mentioned—Will Get Sufficient Fuel—44 Classes Listed

WASHINGTON, April 10—The War Industries Board, of which Bernard M. Baruch is chairman, has issued what it terms "Preference List No. 1," which lists 44 trades that are to be given priority in the delivery of coal and coke. The list makes no mention of automobiles or trucks and the omission of these products is understood to have been because of the tacit agreement made the first week in March by which automobile manufacturers agreed to a reduction in output of 30 per cent and that they would be allowed sufficient fuel to produce the remaining 70 per cent.

The issuance of the list, which is essentially a revision and extension of lists previously issued by the Fuel Administration, is not causing any apprehension. Manufacturers believe that under the terms of the March agreement they will be permitted to get all the fuel they require. No interference with fuel deliveries has been felt to date.

Preference List No. 1 is "for the guidance of all governmental agencies in the supply and distribution by rail or water, of coal or coke." The statement issued with the list states that the board has not undertaken to classify any industry as non-essential or at this time to limit the quantity of fuel which any particular industry or plant shall receive. The industries which are listed "will be accorded preferential treatment by the Fuel Administration in the distribution of coal and coke. The same plan will be followed in according preferential treatment to war industries and plants in the transportation of raw materials and supplies." The statement makes plain that the Priority Commissioner may certify additional classes of industries and additional plants whose operation as a war measure is important. Following is a list of preferred industries:

#### List of Preferred Industries

Aircraft—Plants engaged exclusively in manufacturing aircraft or supplies and equipment therefor.

Ammunition—Plants engaged in the manufacture of ammunition for the United States Government and the allies.

Army and navy cantonments and camps.

Arms (small)—Plants engaged in manufacturing small arms for the United States Government and the allies.

Chemicals—Plants engaged exclusively in manufacturing chemicals.

Coke plants.

Domestic consumers.

Electrical equipment—Plants manufacturing.

Electrodes—Plants producing electrodes.

Explosives—Plants manufacturing.

Farm implements—Manufacturers exclusively of agricultural implements and farm operating equipment.

Feed—Plants producing feed.

Ferroalloys—Plants producing.

Fertilizers—Manufacturers of fertilizers.

Fire brick—Plants producing exclusively.

Food — Plants manufacturing, milling, preparing, refining, preserving, and wholesaling food for human consumption.

Food containers—Manufacturers of tin and glass containers and manufacturers exclusively of other food containers.

Gas—Gas producing plants.

Guns (large)—Plants manufacturing.

Hemp, jute, and cotton bags—Plants manufacturing exclusively hemp, jute, and cotton bags.

Insecticides—Manufacturers exclusively of insecticides and fungicides.

Iron and steel—Blast furnaces and foundries.

Laundries.

Machine tools—Plants manufacturing.

Mines.

Mines—Plants engaged exclusively in manufacturing mining tools and equipment.

Newspapers and periodicals—Plants printing and publishing exclusively newspapers and periodicals.

Oil—Refineries of both mineral and vegetable oils.

Oil production—Plants manufacturing exclusively oil well equipment.

Public institutions and buildings.

Public utilities.

Railways.

Railways—Plants manufacturing locomotives, freight cars and rails, and other plants engaged exclusively in manufacture of railway supplies.

Refrigeration—Refrigeration for food and exclusive ice-producing plants.

Seeds—Producers or wholesalers of seeds (except flower seeds).

Ships (bunker coal)—Not including pleasure craft.

Ships—Plants engaged exclusively in building ships (not including pleasure craft) or in manufacturing exclusively supplies and equipment therefor.

Soap—Manufacturers of soap.

Steel—Steel plants and rolling mills.

Tanners—Tanning plants, save for patent leather.

Tanning extracts—Plants manufacturing.

Tin-plate—Manufacturers.

Twine (binder) and rope—Plants producing exclusively binder twine and rope.

Wire rope and rope wire—Manufacturers.

—

#### Advisory Boards for Petroleum Committee

WASHINGTON, April 10—Members of about 20 advisory boards for the Petroleum War Service Committee will be appointed soon, to carry out its plans of expansion and give representation to allied activities, including tank cars, tank vessels, pipe lines, oil well supplies, natural gas and oil jobbers.

The chairman of each advisory committee will become a member of the national committee, which is working with Director Requa in governing the oil industry. The advisory committee will be:

Advisory Committee for Pacific Coast, Advisory Committee for the Rocky Mountain District, Advisory Committee for Mid-Continent Production, Advisory Committee for Mid-Continent Refining and Marketing, Advisory Committee for Gulf Production, Advisory Committee for Gulf Refining and Marketing, Advisory Committee for Appalachian Production (western division), Advisory Committee for Apalachian Production (eastern division), Advisory Committee for Appalachian Refining and Marketing, Advisory Committee for Atlantic Refining and Marketing (northern division), Advisory Committee for Atlantic Refining and Marketing (southern division), Advisory Committee on Natural Gas, Advisory Committee on Tank Cars, Advisory Committee on Tank Vessels, Advisory Committee on Pipe Lines (southern division), Advisory Committee on Pipe Lines (northern division), Advisory Committee on Oil Well Supplies and the Advisory Committee on Jobbers.

## Standards Delegates Return

### Half of Party Back After International Conference—Remainder Expected

NEW YORK, April 10—Part of the American delegation, which arrived recently in England for a conference on international motor car, truck, tractor, airplane and machinery standards, has returned to the United States. The remainder of the party, it is expected, will return shortly.

The American delegation was headed by F. G. Diffin, representing the Aircraft Production Board, and included members representing the Society of Automotive Engineers, American Society of Mechanical Engineers, American Society for Testing Materials as well as representatives of the Advisory Committee on Aeronautics, the Signal Corps, the Navy and the original International Aircrafts Standards Board.

#### Affect International Manufacturing

It is expected that the conference, which was the result of nine months' work on the part of Mr. Diffin, will have considerable influence on future international manufacturing, enabling better service with less effort by relieving plants from carrying in stock materials not standardized and by concentrating on material of known performance.

It was not the intention of the conference to attempt any standardization of airplane construction, but rather to attempt to standardize certain materials and units which are at present causing difficulty in purchase and delivery.

—

#### To Raise Denby Truck Prices

DETROIT, April 11—The Denby Motor Truck Co. on April 15, will increase factory prices as follows:

| Model | Old Price | New Price | Increase |
|---|---|---|---|
| 1-Ton | $1,490 | $1,650 | $150 |
| 2-Ton | 2,025 | 2,350 | 325 |
| 3-Ton | 2,525 | 2,775 | 250 |
| 5-Ton | 4,900 | 4,900 | ... |

Automotive Industries

# Merchants Discuss War Problems

## 3000 Delegates at U. S. Chamber of Commerce Convention Held in Chicago

CHICAGO, April 10—Three thousand delegates to the sixth annual meeting of the United States Chamber of Commerce to-day pledged themselves to united effort in speeding the winning of the war. War was the big topic and it was proposed, as a measure to eliminate German propoganda, that all papers and periodicals published in the German language be suppressed. This move was urged in a report of the Immigration Committee but in the discussion which followed, F. A. Seiberling, president of the Goodyear Tire & Rubber Co., pointed out that the most important point is to Americanize alien enemies and the best way to do this is through the language which they understand.

Men prominent in the automotive industries are taking part in the convention. Delegates representing the Motor & Accessory Manufacturers Association include president C. W. Stiger of the Stromberg Motor Devices Co.; C. E. Thompson, Steel Products Co.; T. H. Wetzel, New York, and E. H. Broadwell, Fisk Rubber Co.

### Finance and the War

Lucius Teter, president of the Chicago Association of Commerce welcomed the delegates at the formal opening of the meeting this morning with the thought that "out of this meeting shall come the combined results of thought and patriotism of American business men as applied to the issues of to-day."

President R. G. Rhett in replying blamed the Sherman anti-trust law for nearly all the trouble between capital and labor since its passage, arguing that men are afraid to co-operate on account of the law.

The program includes four general subjects: Finance and the war; ships and shipping; railroad and highway transportation; organized control of industries.

On the opening day F. A. Seiberling, president of the Goodyear Tire & Rubber Co. and chairman of the Committee on War Payrolls, filed a report regarding the committee's work in caring for soldiers and soldier's dependents who were on the payrolls of the concerns connected with the committee's field of work. A. W. Douglas, vice-president of the Simmons Hardware Co. and chairman of the Committee on Statistics and Standards, discussed crops and business conditions. A. Lincoln Filene, chairman Committee on Daylight Saving, told of the character of the new daylight saving bill. Henry P. Kendall, chairman Committee on Industrial Relations, rendered a report on industrial relations and general labor conditions.

On Wednesday Waddill Catchings talked on organization of industry; E. A. Filene discussed shipping; H. A. Wheeler, railroads and the war, and W. D. Simmons, finance.

On Thursday there will be a series of group sessions:

1. Waddill Catchings; George N. Peek, War Industries Board; Dr. Frank Taussig, Price Fixing Commission; Julius G. Lay, Foreign Trade Adviser to State Department.
2. Charles A. Hirsch, president American Bankers' Association, Finance; Thomas N. Carter, president Public Service Corp., New Jersey; Theodore N. Vail, Government Financing; Effect on Industry; David Forgan, Effect of Government Financing on Industry.
3. Harry A. Wheeler, Chicago, Railroads; Alba Johnson, president Baldwin Locomotive Co., Terminals; J. F. Wallace, chairman Chicago Railway Commission, Car Supply; E. F. Carry, director of operations, U. S. Shipping Board; Roy D. Chapin, chairman Highways Transport Committee, Motor Truck Transportation; F. A. Seiberling, president Goodyear Tire & Rubber Co., Motor Truck Transportation; Edward A. Filene, Shipping—How Can We Get More Ships in the Next Six Months?

Thursday evening, at 8 p.m., Earl Reading, the English ambassador, will talk on the developments in England in industrial and business lines.

Elections will be held at the convention for new officers, including president, vice-presidents, treasurer and executive committee.

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### Await Decision in Ford-Dodge Case

DETROIT, April 11—The decision in the Dodge Brothers vs. Ford suit now rests with the Supreme Court. The real battle is about the intention of the legislature when it framed the corporation law limiting a company's capital to $25,000,000. Ford's attorneys say that by "capital" is meant capital stock as opposed to capital assets. The other side claims that the limit was imposed on capital assets, which would bar the Ford Motor Co.'s accumulation of $126,000,000, thus forcing the declaration of extra dividends. The final decision is not expected before June.

# Sentiment Is Divided Over Report

## Majority Senate Report Questioned—Potter Mentioned as New Head

WASHINGTON, April 10—The quality of the Senate Military Affairs Committee's majority report, published elsewhere in this issue, is its bluntness; it lacks specific expression and embodies opinions rather than facts. The report is not accepted here as completely as might be expected. Many question it and regard the minority report seriously. Some are inclined to think Howard E. Coffin is referred to by the recommendations that men interested in factories making engines or airplanes be employed by the United States. More believe this recommendation is aimed at Colonel E. A. Deeds.

### Improper Interference Claimed

People interested in a certain foreign engine, and others, are said to have shown their influence against the present organization and added to the suspicions of inefficiency by making superior planes for their engine as compared with the planes equipped with the Liberty engine.

Next, there is a general suspicion that the airplane makers of this country not given Liberty engine contracts have had a finger in the pie and by various means influenced thought antagonistic to the present organization and program. Politics are also said to have entered into the report. The vote of 8 to 6 in favor of the report is said to have been controlled by those parties antagonistic to the present administration.

William C. Potter, civilian head of the Equipment Division of the Signal Corps and the man who has actual charge of the production of airplanes, is now being mentioned as the probable choice of the president to head the reorganized airplane program. Mr. Potter at present enjoys the favor of both the Aircraft Production Board and the Signal Corps.

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### U. S. Tire to Increase Production

PROVIDENCE, R. I., April 10—The plant of the American Locomotive Co., recently bought by the United States Rubber Co. will permit the manufacture of additional tires to the value of $20,000,000 annually. Besides solid truck tires, the new factory will give space to the development of pneumatic cord tires for commercial vehicles.

# U. S. Board Directs Buying

## Requirements Division Formed to Coordinate Purchase of Government Supplies

WASHINGTON, April 8—A directing, centralized purchasing body for all war purchases made in the United States now exists in the Requirements Division of the War Industries Board. This division, formed to-day, will prevent confusion in the purchase and delivery of supplies and will attempt to unify Governmental dealing with industrial problems. It will serve as the central directing agency in the machinery of the War Industries Board. It will be constantly informed of all purchases, contracts and deliveries, and thus enable Chairman Bernard M. Baruch to maintain a complete analysis of the progress of business in the various Government divisions.

Harry L. Horning, chairman of the Automotive Products Section, represents the centralization of purchases in so far as all automotive products are concerned. His duties will include a general supervision over the entire industry and upon the orders placed and materials and production problems. He will not enter into the immediate details such, for example, as making inspection of products for which orders have been placed.

All supply divisions and purchasing departments and the Allied Purchasing Commission requiring automotive products will submit statements to the Requirements Division of their requirements for raw materials and finished products as far in advance as possible. The Requirements Division will in turn delegate the task of fulfilling these needs to H. L. Horning or in some instances where there is no problem connected with the supply or production to the supply departments themselves.

The statements furnished the Requirements Division will include every commodity regardless of a threatened or present shortage or an ample supply. It is hoped by this to prevent that shortage of materials which is the result of badly planned distribution.

In consequence of this new organization, which includes representatives of each section of the War Industries Board, the Army, Navy, Emergency Fleet Corporation, Food Administration, Red Cross, Fuel Administration, Railroad Administration and Allied Purchasing Commission, Mr. Horning's scope will be considerably broadened.

He will be charged with the responsibility of collecting all information regarding trucks, passenger cars, tractors, motorcycles and tanks, including production, available supplies, new sources of supply, methods for increasing production, etc., and will also act as the point of contact representing the Requirements Division with the several departments of the Government, the manufacturers and producers, Hugh Chalmers's National Automobile Chamber of Commerce Committee, A. W. Copland's Motor and Accessory Manufacturers Association Committee, and those war service committees under the supervision of the United States Chamber of Commerce.

He will be the sole Government agency for dealing with the automotive industries. He will co-operate with the Price Fixing Committee and the Priority Division, furnishing them the necessary information to enable them to accurately perform their functions in so far as automotive products are affected. It is hoped that through this new arrangement there will be no such confusion as has been created in the past when, for example, each of the many departments issued similar questionnaires and caused needless duplication of effort to the business men of the industry.

In addition to dealing with the problems already referred to the Automotive Products Section will also consider from time to time the extent of the existing sources of production, creation of new facilities, conversion of existing facilities and the opening of new sources of supplies whenever these problems enter into matters automotive.

The section will also consider market conditions, and when advisable recommend purchase plans to the various buying departments. If it should ever become necessary to control the industry in whole or in part by means of allotments, this will become one of the functions of the Automotive Products Section.

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### Tests of Non-Shatterable Glass

WASHINGTON, April 10—Tests have been made by the Bureau of Standards on two types of non-shatterable glass intended to protect the eyes from splinters when accidents occur which fracture the glass used in spectacles, aviators' goggles, face masks, windshields, etc. One of the glasses tested, designated the A type, has one side covered with a layer of celluloid, while the other, the B type, has a layer of celluloid sandwiched between two layers of glass.

Comparative values of the dynamic strength and shatterability of the glasses were obtained by subjecting them to sudden shock or impact, either by dropping a steel ball on the glasses or by shooting a bullet at them. Concerning the B type, which, according to reports, is the glass known as Resistal, made by Straus & Buegeleisen, New York, the data says that when subjected to the dropping steel ball test, in general it lost no splinters from the rear side until the front was completely shattered and the steel ball struck the intervening layer of celluloid. When a 30-caliber bullet was fired at the glass from a distance of 25 yd. with a muzzle velocity of 2700 ft. p.s., it made a clean-cut hole and produced numerous irregular cracks in each of the sheets of glass separated by the celluloid. These cracks were confined to a circular area of about 2 in. radius and the remainder of the 4 by 10-in. plate was firmly held against rubber strips on a target. All the glass except a small area immediately around the bullet hole was firmly held by the celluloid.

# Reorganized Parrett Tractor

## Claire L. Barnes and Vincent Bendix Interested in New $3,000,000 Company

NEW YORK, April 8—The Parrett Tractor Co. of Delaware has been organized with a capital of $3,000,000 fully paid in and has acquired the assets and plant of the Parrett Tractor Co. of Illinois, which has been producing farm tractors since 1912. Among the principal movers behind the new company, which is now producing 50 tractors a day and proposes to build 5000 during the present year, are Claire L. Barnes, for several years personal representative of John N. Willys, and Vincent Bendix, inventor of the Bendix drive for electric starters. Barnes and Bendix have been associated in arranging for the financing of the new company, final arrangements for which were completed through the banking firm of McClure, Jones & Reed of New York.

Dent Parrett is president of the new company and associated with him are vice-president and general manager Claire L. Barnes; vice-president Robert Barbour, who is also chairman of the board of directors and president of the Barbour Flax Spinning Co., Paterson, N. J., and director of the following companies and banks: United Shoe Machinery Co., Linen Thread Co. of America, Barbour Flax Spinning Co., Safety Car Heating & Lighting Co., Linen Thread Co. of Great Britain, First National Bank, Paterson, Hamilton Trust Co., Paterson; secretary Warren Barbour, president of the Linen Thread Co. of America and a director of the following companies and banks: Linen Thread Co. of America, United Shoe Machinery Co., Linen Thread Co. of Great Britain, American Net & Twine Co., Hanover National Bank, New York, Greenwich Bank of New York, Paterson Savings Institution, Paterson; treasurer Arthur Gardner, formerly vice-president of the Central Locomotive & Car Co., Chicago; works manager Robert C. Webster.

Dent Parrett is one of the pioneers in the tractor industry and is chairman of the Tractor Division of the Standards Committee of the Society of Automotive Engineers.

The present plant of the Parrett company at Chicago Heights, Ill., has a capacity of 7500 to 10,000 tractors a year; over 200 tractors were shipped during March. The company is now behind immediate shipping orders and will increase production as rapidly as possible. The officers and Henry A. Rudkin of McClure, Jones & Reed form the board

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### Fulton Tractor Leases Madison Plant

ANDERSON, IND., April 5—Part of the plant of the Madison Motors Corp. has been leased to the Fulton Tractor Co., recently incorporated for $1,000,000, and the production of tractors will be undertaken at once.

# Select Aero Mail Landing Sites

## Belmont Park, Long Island, to Be Terminal in Washington-New York Service

WASHINGTON, April 9—The three landing places for airplane mail service between Washington and New York have been selected. The fields are being prepared and hangars erected as speedily as possible. The service will be in operation not later than May 15, and possibly much sooner.

The three landing fields selected are, Potomac Park, Washington; Bustleton, North Philadelphia, Philadelphia, and Belmont Park, New York.

The hangars at Potomac Park are in course of construction, and will be started soon at Bustleton and Belmont Park. Extensive rolling and grading of the Philadelphia field will be done this month.

Assuming that the airplanes leave New York at noon for Washington and leave at the same hour from Washington for New York, rail connection for destination beyond those cities and Philadelphia will be made which would otherwise be impossible. In addition to saving time in the delivery of letters addressed to New York, Philadelphia and Washington, there will be much time saved by making connections for earlier trains for places beyond the terminals.

An airplane leaving New York at 12 o'clock noon, arriving at Philadelphia at 1:30 and at Washington at 3:30, will make connection with trains several hours earlier than present connections for many cities in New Jersey, Pennsylvania, Delaware and Maryland. At the same time the mail reaching Washington at 3:30 will make connection with numerous trains leaving Washington at 4 p.m. for points in the south and southwest. The Post Office estimates that at least 8 hours will be saved by the airplane route.

The airplanes leaving Washington on the noon schedule will arrive at New York at 3:30 and their mail will be delivered in New York in the late afternoon city delivery over the entire city. To make this delivery by train, letters now have to be mailed at the railroad terminal in Washington before 9 a.m.

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### Investigate Petroleum Prices

WASHINGTON, April 9—The Interstate Commerce Commission has ordered an investigation to learn why petroleum and petroleum products vary in price in different localities. The order reads as follows:

"It appearing, that in recently effective changes and increases in rates in official classification territory, there is wide variance in the amounts and percentages of increases in the rates on petroleum and petroleum products as between various localities in that territory and complaint having come to the commission concerning both the amounts of the increases and the changes in relationships of such localities, and it appearing that this adjustment of rates could be more equitably and comprehensively considered and disposed of by a general investigation covering the whole situation:

"It is ordered that the commission upon its own motion enter upon an investigation into and concerning the propriety of the rates, rules, regulations and practices of common carriers subject to the act to regulate commerce governing transportation of petroleum and its products between points in official classification territory, with a view to prescribing just and reasonable rates, rules, regulations, and practices to govern such transportation and just and reasonable relationships of rates."

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### Machinery, Tool and Supply Men to Meet

CLEVELAND, O., April 9—The problem of manufacturing and supplying machinery and tools, sufficient for carrying out the government program for the production of ships, shells, guns and aircraft, will be the subject considered at the war convention of the machinery, tool and supply industry of the country to be held in Cleveland the week of May 13.

One thousand men who are bearing the brunt of the unprecedented demand for machinery will gather from all parts of the country to lay out a plan, with the aid of government officials, to keep the great munition program going at top speed. The war convention will be a joint meeting of four great national associations, the American Supply & Machinery Manufacturers' Assn., the National Supply & Machinery Dealers' Assn., the Southern Supply & Machinery Dealers' Assn., and the National Pipe & Supplies Assn.

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### Gas Engine Assn. to Meet June 3 and 4

CHICAGO, April 9—The eleventh annual meeting of the National Gas Engine Assn. will be held at Hotel Sherman here on June 3 and 4. On the morning of June 3, there will be a joint meeting between the association and the members of a committee from the National Federation of Implement and Vehicle Dealers' Assn. to discuss repair parts.

At the afternoon session, among the subjects to be discussed are "The Iron and Steel Situation," and "The Labor Situation."

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### Bursner President of American Motors

NEW YORK, April 9—At a meeting of the Board of Directors of the American Motors Corp., the following officers were elected: President, Robert Bursner, to succeed William Howard Hoople; secretary-treasurer, Proctor W. Hansl. Louis Chevrolet was re-elected vice-president and chief engineer, and George W. Cravens was appointed general manager.

At the annual meeting of the stockholders, the company elected the following directors: William Howard Hoople, Brooklyn; Louis Chevrolet; Robert Bursner; Ralph D. Mock, Cleveland, treasurer of the Hydraulic Pressed Steel Co.; Fred Radel, Newark, N. J.; George G. Gates, auditor of the American Motors Corp.; George W. Cravens, chief engineer and works manager of the Elkhart Carriage & Motor Car Co.; Arthur L. Johnson, Brooklyn, and Proctor W. Hansl.

# Another Truck Train for Goodyear

## Four 3½-Ton Solid-Tire Trucks to Carry Tires to Newark and Bring Back Rubber

AKRON, OHIO, April 9—The Goodyear Tire & Rubber Co. will start additional motor truck service to-morrow, when four 3½-ton solid-tired trucks will leave this city with a shipment of tires for the Newark, N. J., branch of the company. It is expected that the trucks will make the 500-mile trip in less than 4 days, and that on their return trip they will bring crude rubber back to the Akron plant.

These trucks have been hired for this purpose and are distinct from the fleet of 7 Goodyear penumatic-tired trucks which the company has been operating between Akron and Boston for some time. The introduction of the solid-tired trucks marks the first step in the proposed plan of the Goodyear company to ship all of its goods to the eastern seaboard and as far west as the Mississippi River by motor trucks as was first intimated in the article on the Goodyear company's Akron to Boston run published in AUTOMOTIVE INDUSTRIES for February 28. It is intended to employ other trucks later to carry tires to Cincinnati, where they will be loaded on the Mississippi River boats.

This increase in the Goodyear company's delivery fleet is the first step in a development of the service, for the Goodyear traffic officials say that they see no relief from the present railroad congestion for at least 5 years.

The trucks are 3½-ton Packards owned by the Cleveland, Akron & Canton Transfer Co., Akron, Ohio. The same company has been operating a fleet of 21 trucks in overland haulage throughout the State of Ohio since May, 1917. The trucks will be under the supervision of C. H. Smith, superintendent of the company, who plans to make the trip over the Lincoln Highway route in 50 hr. The trucks will leave Akron at dawn on April 10 and will be driven 16 hours a day. As there are about 14 hours of daylight at this time of the year, the 16-hour continuous run will mean only 2 hours of night driving daily. It is expected that the trucks will average 10 m.p.h., which with 16 hours running a day, would make the total running time 3 days 2 hours. It is expected that the cost of delivery will be about the same as express rates between Akron and Newark, N. J. These rates are $1.90 per 100 lb. The trucks will carry a load of 9000 pounds, so that if the cost is the same as the express rates, the charge for each truck for the run will be approximately $171.

The run of the trucks to Newark and return will be something of an experiment to determine the cost of overland truck transportation under commercial conditions.

# Ford "Two-Man" Tank Appears

## To Carry 1200 Lb. Armor, Two Guns and Two Men—Speed Will Be 12 M. P. H.

NEW YORK, April 10—The first model of what is understood to be the Ford "Two-man Tank," numbers of which will be produced by the Ford Motor Co. if tests prove satisfactory, was revealed to public gaze at Springfield, Mass., yesterday and is illustrated herewith. Experimental work on the tank has been progressing for some time under the supervision of C. H. Martin of the Martin Rocking Fifth Wheel Co., Springfield, its inventor, and it is understood that three machines are now being constructed for the Ordnance Department and Quartermaster Corps, and will be tested by these divisions.

Neither armor nor armament is shown and it is understood that details have not been decided as yet. It is likely, however, that the tank when in fighting trim will carry about 1200 lb. of armor and two machine guns. It is to be manned by two men and its speed will be about 12 m.p.h. on smooth going, and slightly less on rough going.

In construction, all the essential elements of the Ford chassis are retained with the exception of the running gear. In place of wheels there are two endless belts running over a series of idler pulleys and driven through sprockets which in turn are driven off the Ford rear axle. The method of steering and other details are not disclosed.

It is stated that the little tank will do practically anything its big brothers will do in the way of climbing obstacles in proportion to its size and that it will successfully negotiate almost any kind of bad going.

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### Look for Gasoline Increase

NEW YORK, April 10—It is said that advances in the price of gasoline are coming. Refiners point out that increases in the cost of labor, crude oil and other supplies have made this necessary and look for fuel to go up from one to two cents a gal. The principal difficulty, however, is transportation and it is stated that one refiner has had to close a number of New Jersey filling stations because it was impossible to get gasoline to them. Retail prices at present range from 20.4 cents in St. Louis to 26 cents in Dallas, San Antonio and New York.

*The Ford "Two-Man Tank" retains all the essential elements of the Ford chassis except the running gear, which is replaced by two endless belts driven from sprockets from the Ford rear axle*

# Detroit Faces Labor Shortage

## 20,000 Skilled Workers Needed —Michigan Divided Into 15 Industrial Districts

DETROIT, April 11—The labor shortage is growing more serious here, and 20,000 men are needed for skilled work. Efforts are being made to remedy this shortage and get conditions back to normal before the end of the month.

The Lincoln Motor Car Co. will employ 5000, the Dodge Munitions factory another 5000 and the Detroit Shell Corp. 3000, when they are operating at full capacity. This means that a need for an extra 13,000 men will be felt.

The competition for workers among various local plants has resulted in inflated payrolls, and has seriously interfered with the completion of government contracts.

The State of Michigan has been divided into 15 industrial districts for the purpose of bringing about a co-ordination of industrial conditions, so as to aid the government in carrying on its war activities. Each district embraces cities so located that officials of the different industries may go to the various factories and return to their district headquarters in a short time.

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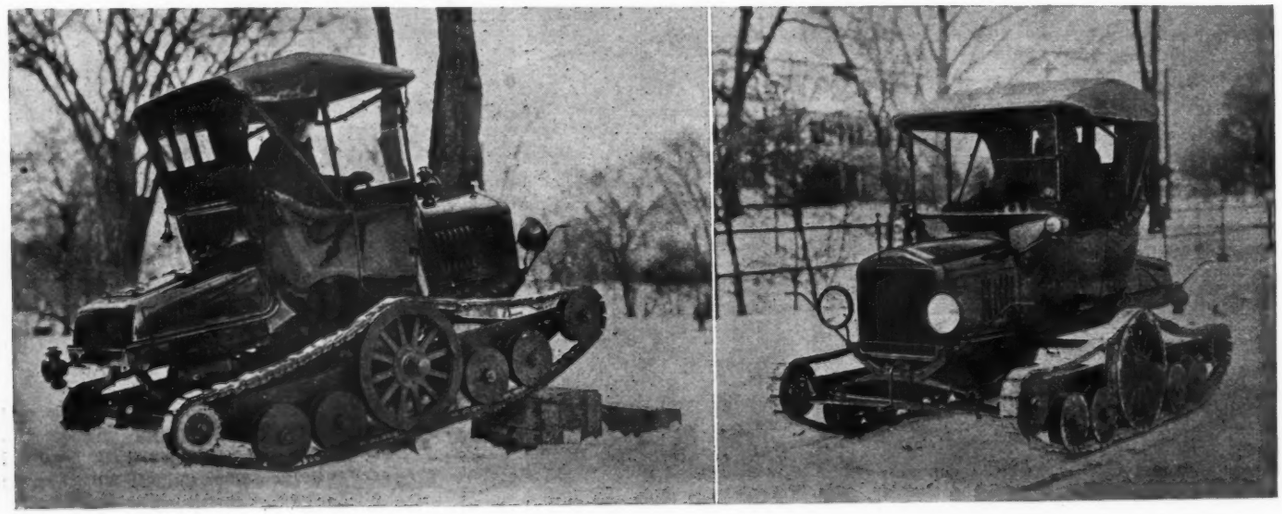
### Hartford Holds Eleventh Show

HARTFORD, CONN., April 10—The eleventh annual show of the Hartford Automobile Dealers' Assn., which was held last week, included cars, trucks, tractors and trailers. The exhibit was held in the State Armory, and was under the auspices of the Home Guard.



# New York Shipments Decrease

## February Amount 60 Per Cent of January Exports and 61 Per Cent of Total from U. S.

NEW YORK, April 9—Exports of automobiles, trucks and parts from New York during February amounted to $4,172,261, or only 60 per cent of the January totals. The decrease corresponds almost exactly with the general decrease of all automobile, truck and parts exports from the United States during the month. The New York exports form about 61 per cent of the total.

There was a decided falling off in the number of passenger cars sent to South America from New York. Brazil's shipments were only 136 in February as compared with 228 in January, and Chile bought 197 as compared with 271 the month before.

All cars and trucks sent to England and France in February went via New York. Argentina and Chile receive most of their cars and trucks via New York also, but shipments to most of the other South American countries are made either by railroad or sent by way of a southern port.

The percentage of cars sent to Australia, the Philippine Islands, New Zealand, the Dutch East Indies and Canada, from New York is negligible, although each buys many American cars and trucks.

# April 14 Is Last Day for Importing Restricted Goods

WASHINGTON, April 6—The War Trade Board has issued a notice to all holders of outstanding licenses for the importation of commodities named in the recently issued list of restricted products that such licenses will become void unless shipment is made on or before April 14, 1918. Shipment as required by this ruling consists of actual delivery of the goods licensed to the carrier on a through export or ocean bill of lading.

To satisfy the War Trade Board and Customs authorities that shipment under the import licenses relied upon has been made within the prescribed time, the importer will be required to present a copy of the carrier's through export or ocean bill of lading, showing delivery to the carrier of the goods licensed, on or before April 14, 1918.

As announced on March 23, 1918, the importation of most of the commodities on the Restricted List from Europe is not absolutely prohibited, but will be permitted under certain circumstances, such circumstances being generally that the goods may be shipped, if it will not interfere with the speedy operation of vessels carrying troops and supplies from the United States for the European battlefronts. For license to make such importations new applications must be made, and the applicants must show in such applications the facts under which it is claimed that shipment can be made without delay to vessels. These applications will be especially considered and applications granted where it appears that no delay will occur.

## Automobile, Truck and Parts Exports from New York for February

| Country | Passenger Cars No. | Passenger Cars Value | Commercial No. | Commercial Value | Parts Value |
|---|---|---|---|---|---|
| Argentina | 259 | $171,667 | 2 | $4,338 | .... |
| Australia | 25 | 18,918 | ... | .... | .... |
| Barbados | 11 | 6,581 | ... | .... | $562 |
| Bolivia | 1 | 816 | ... | .... | .... |
| Brazil | 136 | 65,722 | ... | .... | .... |
| British East Africa | 24 | 19,917 | ... | .... | .... |
| British Guiana | ... | .... | 1 | 600 | .... |
| British South Africa | 31 | 29,213 | 1 | 1,800 | .... |
| British West Africa | 4 | 1,485 | ... | .... | .... |
| British West Indies | 2 | 1,400 | 1 | 600 | 976 |
| Chile | 197 | 229,035 | 21 | 14,313 | .... |
| China | ... | .... | ... | .... | 430 |
| Colombia | 53 | 19,870 | ... | .... | .... |
| Costa Rica | ... | .... | ... | .... | 242 |
| Cuba | 103 | 112,227 | 20 | 37,661 | 51,912 |
| Danish West Indies | 2 | 730 | ... | .... | 57 |
| Dutch East Indies | 2 | 730 | ... | .... | 502 |
| Dutch Guiana | 2 | 730 | ... | .... | .... |
| Ecuador | 10 | 9,671 | ... | .... | .... |
| England | 63 | 189,783 | 385 | 1,045,308 | 150,028 |
| Egypt | ... | .... | ... | .... | 156 |
| France | 28 | 44,170 | 86 | 424,977 | 352,378 |
| French West Indies | 15 | 9,604 | ... | .... | 12,238 |
| Guatemala | 1 | 2,483 | ... | .... | 67 |
| Haiti | 2 | 1,435 | ... | .... | 748 |
| Honduras | ... | .... | ... | .... | 1,142 |
| Italy | 52 | 31,286 | 1 | 1,055 | 8,690 |
| Iceland | ... | .... | ... | .... | 297 |
| Jamaica | 26 | 15,827 | ... | .... | 5,568 |
| Japan | 9 | 8,032 | 6 | 10,520 | .... |
| Liberia | ... | .... | ... | .... | 18 |
| Mexico | 13 | 11,291 | 4 | 7,998 | 16,729 |
| Morocco | ... | .... | ... | .... | 50 |
| Newfoundland | ... | .... | ... | .... | 31 |
| New Zealand | 5 | 4,950 | ... | .... | .... |
| Nicaragua | 1 | 395 | ... | .... | 281 |
| Panama | 13 | 6,670 | 2 | 1,270 | 5,131 |
| Paraguay | ... | .... | ... | .... | 210 |
| Peru | 51 | 61,322 | 7 | 15,607 | 9,153 |
| Santo Domingo | 7 | 5,367 | ... | .... | 1,018 |
| Scotland | 25 | 85,000 | 35 | 119,000 | .... |
| Spain | 78 | 100,426 | 3 | 3,732 | 23,102 |
| Trinidad | 11 | 6,855 | ... | .... | 5,783 |
| Uruguay | 453 | 212,861 | .... | .... | 18,910 |
| Venezuela | 15 | 5,475 | ... | .... | 2,049 |
| Total | 1,730 | $1,491,944 | 575 | $1,688,779 | $991,538 |

# Gasoline Exported to Entente

## Gradual Shifting of Shipments from Neutral Countries to Allies Taking Place

WASHINGTON, April 10—The United States exported 17,676,884 gallons of gasoline during January, 1918, valued at $4,335,637, the greater part of which went to the United Kingdom. France was the second largest purchaser, and Italy came third.

Gradual shifting of gasoline exports from neutral countries to the Allies is taking place. In December, 1917, Brazil received 878,058 barrels, but got none during January. Uruguay, Venezuela and the Philippines likewise received no gasoline from the United States during January.

Tables showing gasoline exports for January, 1918, and for the 7 months ending January, 1918, follow:

| | —January, 1918— Gallons | Value |
|---|---|---|
| France | 6,134,090 | $1,305,080 |
| Italy | 1,080,968 | 375,987 |
| United Kingdom | 6,222,681 | 1,507,324 |
| Canada | 652,134 | 119,005 |
| Panama | 205,210 | 64,949 |
| Mexico | 35,783 | 8,458 |
| Cuba | 238,629 | 72,741 |
| Argentina | 712,040 | 231,769 |
| Brazil | ..... | ..... |
| Uruguay | ..... | ..... |
| Venezuela | ..... | ..... |
| Australia | 672,000 | 185,710 |
| New Zealand | 350,400 | 102,473 |
| Philippine Islands | ..... | ..... |
| British So. Africa | 50,000 | 17,700 |
| Other countries | 1,322,949 | 344,441 |
| Totals | 17,676,884 | $4,335,637 |
| 7 mos. ended January, 1918. | | |
| France | 24,094,450 | $5,428,390 |
| Italy | 18,561,624 | 4,700,864 |
| United Kingdom | 36,885,187 | 8,077,202 |
| Canada | 15,108,919 | 2,732,492 |
| Panama | 697,070 | 194,067 |
| Mexico | 687,651 | 191,029 |
| Cuba | 2,520,976 | 645,001 |
| Argentina | 2,121,586 | 492,939 |
| Brazil | 4,073,913 | 1,045,196 |
| Uruguay | 400,020 | 64,007 |
| Venezuela | 188,770 | 62,038 |
| Australia | 5,396,245 | 1,321,457 |
| New Zealand | 3,160,831 | 852,569 |
| Philippine Islands | 1,139,504 | 281,762 |
| British So. Africa | 2,009,490 | 602,734 |
| Other countries | 7,927,369 | 2,096,048 |
| Totals | 124,973,605 | $28,787,795 |

### Ontario Dealers Organize

TORONTO, April 9—Motor car and accessory dealers of Ontario have organized as a section of the Retail Merchants' Assn. of Canada. The organization will have separate meetings, and handle its own problems, but will operate through central association headquarters in Toronto, in much the same way as labor organizations operate. S. H. Rowed, of the Ontario Garage & Sales Co., London, Ont., was elected chairman.

### Gramm-Bernstein Completes Additions

LIMA, OHIO, April 10—The Gramm-Bernstein Motor Truck Co. has completed new factory additions, and has adopted the progressive assembling system. A 3-story administration building is being erected, as well as a garage for the cars of employees.

# French Tax Cars 10 Per Cent

## Parliament by Unanimous Vote Classes All Cars, Chassis and Bodies as "Luxury"

PARIS, March 10—By a practically unanimous vote the French Parliament has decided that the luxury tax shall be levied at the rate of 10 per cent of the selling price of all passenger cars, chassis and bodies. This is a modification of the original law which considered automobiles as luxuries only when they exceeded 12 hp., or when the selling price was more than $3,000.

Trucks, public passenger vehicles, tractors, etc., are not taxed. The luxury tax is applied, however, to all motor boats and motor boat engines. Motorcycles, sidecars, cyclecars and similar vehicles have to pay 10 per cent luxury tax when the individual selling price is more than $400. Bicycles selling at more than $50 are taxed 10 per cent.

Objection has been raised to including automobiles in the luxury list while pianos and many classes of costly furniture are excluded. So little attention was paid to the automobile manufacturers' protest, however, that instead of withdrawing the tax, the Government applied it to all passenger vehicles. For the time being no income will be obtained from the tax so far as automobiles are concerned, for there is not a manufacturer in France who has a car for sale, and the few dealers having machines in stock are unable to find clients for them owing to withdrawal of all supplies of gasoline for civilian uses. It is believed that had manufacturers been interested in making private sales they would have shown a more stubborn fight against the classification of automobiles in the list of unconditional luxuries.

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### German Airplane Has 3 Propellers

WASHINGTON, April 8—It is reported that Germany is manufacturing a new airplane fitted with three propellers, one arranged so that it will keep the airplane stationary long enough to permit accurate bomb throwing. It also stated that the Germans send up a number of captive balloons without crews, attached to electrified steel cables which imperil allied aviators.

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### Liberty Trucks to Parade

WASHINGTON, April 7—Two full companies of Liberty trucks and National Army soldiers took part in the Liberty loan parade at Cleveland on April 6.

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### Michigan's Tractors Arrive

LANSING, MICH., April 6—The first carload of the thousand tractors which the War Preparedness Board of the State of Michigan bought from Henry Ford & Son, Dearborn, for distribution among farmers, arrived here yesterday. By late afternoon of the same day, six happy farmers were chugging their way farmward with the intention of putting their new possession immediately to work. Today deliveries were made at Mason, Stockbridge and Owosso, and within a few days practically the entire thousand will be at work in the fields of the State. Up to the close of last week, the War Preparedness Board had received signed orders for nearly half the tractors bought, and had received $75,000 in advance payments.

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## Motor Fuel Restrictions Again Revised in England

WASHINGTON, April 9—New restrictions for the use of gasoline and gas as fuel for cars and trucks have been passed in England, according to a consular report. Some of these are to prevent undue expenditure of labor and material in attaching gas apparatus to cars used privately or for pleasure purposes only.

Permits for both gas and gasoline will not be issued to the same vehicle, except in emergency cases where commercial vehicles holding gas permits cannot obtain more than 4 gallons. Owners of motor omnibuses must give estimates of monthly mileage on gas and petrol respectively, and gas permits will be granted provided the petrol quantity license be reduced proportionately.

Owners of commercial vehicles seeking gas permits must provisionally surrender one-third of their present allowance of petrol. Owners of both omnibuses and trucks must furnish a monthly statement of the mileage run on gas and petrol and the reduction of the petrol quantity license will be adjusted accordingly. It is not proposed to make any reduction of the existing allowance of gasoline in respect to mileage run on gas prior to Jan. 3. A gas permit will not confer the right to demand a supply of gas, but will allow it when it is available. There is at present no restriction on the amount that may be used.

Under the new order passenger cars licensed as taxicabs may be hired while in the street or at the station for provided purposes and be driven within the area for which they are licensed and to any point 3 miles beyond. The purposes for which taxicabs may be used are the same as those regulating private cars.

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### Canadian Customs Requirements

WASHINGTON, April 5—The War Trade Board announces that the authority heretofore given to Collectors of Customs along the Canadian border to accept shipments without the required number of declarations is being withdrawn. Any shipment destined to Canada or Newfoundland made on or after April 8, 1918, will be refused clearance unless accompanied by 4 copies of the shipper's export declaration, Customs Cat. 7525, as prescribed in the Treasury Decision 37470.

# Canada to Restrict Imports

## Motor Cars May Be in List of Prohibited Products—Final Action Not Yet Taken

TORONTO, ONT., April 9—Canadian business has been spending so much money in the United States that the Dominion Government desires to even things up, if possible. The balance in favor of the United States is $400,000,000 a year. To cut down this foreign spending it is proposed to limit certain imports, and although no final action has been taken so that automobiles and allied products will be affected, the general idea is that the import of things Canada makes or can do without be limited immediately.

The Ontario dealers who are organizing here to-day will consider the matter and Manitoba dealers have appealed to the War Trade Board for a modified arrangement that will be more equitable. About 6 cars are made here, and strict limitation of imports would favor these to the exclusion of all the rest. One American make would be benefited by a large number of cars in storage.

The dealers are backing the war strongly, but believe the limitation should be so applied that all would contribute alike. They do not believe the car is nonessential if Canada is to keep up her great food production in 1918.

Canada must raise more than $1,000,000,000 this year for the war, and the task is recognized as enormous by authorities.

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### Canadian Embargo Matter of Conjecture

DETROIT, April 9—What effect the proposed Canadian embargo on automobiles will have on the local industries is not known. All the plants are rushing cars into the Dominion as fast they can to stock the dealers before the bill becomes effective. If the bill goes through, many manufacturers who wish to retain their Canadian trade will establish assembling plants across the border provided the cost is not too great in proportion to the business.

Those whose Canadian business is only a small percentage of their total sales will not worry about the embargo and will confine their efforts to domestic demands. The proposed bill has stimulated buying by Canadian dealers and most of them already have a supply of cars to carry them for a long time. It is reported that in the neighborhood of 5000 cars are stored in Windsor awaiting delivery to other Canadian points.

Although the Cadillac Motor Car Co. dislikes to go out of the Canadian field it is hesitating to establish an assembly plant there. Many other manufacturers feel the same way about the matter. The bill, as it is understood here, provides for a total embargo or 10 per cent increase of duty. In either event the importation of cars will be shut off.

# Minneapolis S. A. E. Discusses Lubrication

## Standard Specifications Proposed to Eliminate Troubles—Necessity for a Multiplicity of Grades Denied by Tractor Men—Buffington Elected Chairman

MINNEAPOLIS, April 9—Need of many different grades of oil for different types of engines was declared to be a talking point of oil salesmen by H. C. Buffington, secretary of the Minneapolis Section of the Society of Automotive Engineers, at the monthly meeting held April 3 in the Hotel Radisson. His statement followed a suggestion for standardization of oil specifications by Field Secretary R. E. Plimpton, who happened to be present. The oil men came back with the suggestion that if the manufacturers would improve their engines there would not be so much trouble and no need for so many grades of oil.

The main talk of the evening was by William G. Clark of the engineering department of the Wilcox-Bennett Carbureter Co., Minneapolis, on Tractor Motor Lubrication and Lubricating Oils. This was supplemented by a talk on Oil Distribution by Charles P. Fortner of the Standard Oil Co., and talks on Oil Tests by J. V. Mahoney, automotive engineer for Minneapolis, and W. G. Godron, automotive engineer for the Argentine district, both of the Vacuum Oil Co.

### Lubrication Causes Most Trouble

Mr. Clark said 75 per cent of field troubles with the tractor were due to faulty lubrication. The oil system should be designed for the type and service of engine to be utilized in any tractor. Heavy oil consumption must be expected and the splash system was especially easy to understand and operate. The selection of oil should depend on the type of motor and the service it was used in. There is a close relation between carburetion and lubrication.

Mr. Fortner discussed the steps taken by his company to give the farmer oil service in all parts of the country. Every 20 miles on railroad lines there is a station, and with tank wagons the company expects to deliver direct to the farmer. If the farmer knows that he can get fuel and oil right at his door, it will be an inducement for him to buy a tractor.

### Schools Benefit Farmers

Mr. Mahoney said "Tractor schools are making the farmers better operators." The Vacuum Oil Co. has an oil for each part of the engines on the market. They will tell the farmer which oil to use and then, if a tractor falls down due to the oil used, that oil will be sold no more in that district.

Mr. Godron, a Diesel engine expert, discussed the advantages of this type of engine thoroughly and answered many questions as to its lubrication and fuel. It is the engine of the future, he said, and is certain to replace the steam engine where oil is to be had, but perhaps it will not be available for the tractor, automobile and airplane in the near future. What these advantages are as to saving of room due to the absence of boilers and coal bunkers, by utilizing the necessary space in the double bottoms for oil storage, and the ease with which the Diesel can accomplish the change from full speed ahead to full speed astern, he recited in full. If the right oil is utilized there is no carbon deposit, he said. The fuel should not have a great percentage of water, which reduces the efficiency; should have less than 2 per cent of sulphur, which corrodes the exhaust valves; ash and asphaltum should be as small a proportion as possible, as everything that is not combustible remains.

### Suggests Oil Specifications

Mr. Plimpton took the floor to ask whether it was possible to "get the oil men together." He said specifications had been drawn for standardization, and he asked if they could be fixed so that oil could be obtained of the right quality and at a fair price. Such a standard would save expensive experiments. Mr. Fortner said the engineers were asking something a little beyond the possible: They must build the engines a little different from what they were now.

Mr. Clark discussed the new methods of the Stratford tests referred to by Mr. Plimpton as the basis for the standard specifications. Physical tests, he said, are of no value to the consumer. Mr. Stratford has drawn up specifications that can be used for any oil for use in internal combustion engines.

### Argument Refuted

Mr. Buffington said he did not see why it was impossible to buy oil on specifications. He had found that some engines would run on several kinds of oil. He believed that the oil men could get along without so many talking points, without so many oils, and could get somewhere near a standard oil. Certain oils worked better than others, but there was no need to split hairs about it and no need of such a wide range of oils.

Mr. Plimpton said he had been encouraged to believe that Mr. Stratford was on the right track. He is an oil man and believes that standardization can be accomplished.

It was reported that the section had 154 members and associates. The standards committee reported that sub-committees had been appointed to determine the most desirable methods and mixture for casting pistons and cylinders; to report on gear teeth and adequate range of size, on steel and heat treatments, and on the ball and socket joints for control rods. Further committees will be appointed later.

The annual election resulted as follows: Chairman, H. C. Buffington, Minneapolis Steel & Machinery Co.; vice-chairman, J. L. Mowry, University of Minnesota; secretary, C. T. Stevens, Reinhard Bros. Co.; treasurer, J. C. Clapper, Toro Motor Co. Mr. Plimpton complimented the retiring officers and committees on their work for the society. W. J. McVicar of the McVicar Engineering Co., temporary chairman, announced that the new officers will take charge at the annual dinner, May 1, when Professor J. L. Mowry will speak on Resistance to Rolling of Tractor Wheels.

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### McFarlan Price Increase

CONNERSVILLE, IND., April 6—The McFarlan Motor Co. has increased all prices $400, as follows:

| Model | Old Price | New Price |
|---|---|---|
| Two-passenger roadster | $3,500 | $3,900 |
| Four-passenger roadster | 3,500 | 3,900 |
| Destroyer design four-passenger touring | 3,750 | 4,150 |
| Five-passenger Pasadena | 3,500 | 3,900 |
| Six-passenger touring | 3,500 | 3,900 |
| Seven-passenger touring | 3,500 | 3,900 |
| Town car | 4,600 | 5,000 |
| Knickerbocker cabriolet seven-passenger | 5,250 | 5,650 |
| Sloping "V" front sedan | 4,600 | 5,000 |
| Sloping straight front sedan | 4,600 | 5,000 |
| Philadelphia Berline | 4,900 | 5,300 |
| Limousine | 4,650 | 5,050 |
| Continental landaulet | 4,900 | 5,300 |

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### Truck Service Around Indianapolis

INDIANAPOLIS, April 6—The Intercommunities Transfer Terminal Co. of this city has been incorporated to conduct a motor truck route between Indianapolis and towns within a radius of 50 miles. Twenty-two routes have been planned and the company expects to begin operations by April 15. Ten trucks are to be used and these have already been delivered.

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### Martin Airplane Plant Nearly Ready

CLEVELAND, April 8—The 5-acre plant being built for the Glenn L. Martin Airplane Co. is rapidly approaching completion, and it is expected that the Martin company will be in production in about 60 days.

The formation of this company marked the entrance into the airplane industry of a concern which not only intends to build war products, but which will probably be an important factor in the commercial airplane post-war developments.

The company is incorporated for $2,000,000 and has erected its plant on a 55-acre field, which is sufficient not only to give plenty of room for expansion but also to allow a landing and experimental field for the planes manufactured. Only in a few instances have airplane factories been able to obtain flying accommodations in close proximity to the plant.

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### 10,000 Cleveland Tractors in 1918

CLEVELAND, April 9—The Cleveland Tractor Co. is planning a production of 10,000 machines during 1918. Production for the 9 months from April to December, 1917, was 1032 tractors. Several additions to the plant were built last year.

## New York City to Have a Return Loads Bureau

NEW YORK, April 10—New York City, the point of greatest traffic congestion, is to have a return loads bureau. The Merchants Assn. of the city has appropriated $5,000 to start an office which will handle the work of putting truckmen and shippers in communication with each other.

The work will be under the direction of the regular Traffic Bureau of the association, and will be directly connected with the transportation problems of many of the largest merchants in the city. The Traffic Bureau handles railroad and shipping problems as well as all questions of movement of products pertaining to members of the association.

It has been suggested that the New York bureau guarantee the responsibility of the truckman and the shipper. No definite steps have been taken, but the association is working on the problem.

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### Massachusetts Registration Increases

BOSTON, April 8—Up to April 1, 1918, the Massachusetts Highway Commission registered 110,775 motor vehicles, as compared with 95,798 in the first 3 months of 1917. This is an increase of 17 per cent.

The proportion of passenger cars decreased slightly, being 86,820 or 82 per cent of the total for 1917 and 78,439 or 79 per cent for 1918. Commercial vehicles listed were 23,955 this year as compared with 17,359 in 1917, an increase of 30 per cent. The commercial vehicles already registered in 1918 come within 10 per cent of the total for all of 1917.

Registration and license fee figures follow:

| | Jan. 1 to Mar. 31, 1917 | Jan. 1 to Mar. 31, 1918 | Increase |
|---|---|---|---|
| Total vehicles | 95,798 | 110,775 | 14,977 |
| Passenger cars | 78,439 | 86,820 | 8,381 |
| Trucks | 17,359 | 23,955 | 6,596 |
| Makers, dealers | 3,055 | 2,233 | *822 |
| Motor cycles | 3,393 | 4,024 | 631 |
| Licenses | 10,042 | 8,774 | 1,268 |
| Renewals | 22,024 | 26,765 | 4,741 |
| Examinations | 3,101 | 2,942 | 159 |
| Receipts | $1,058,674.14 | $1,190,968.55 | $132.294.41 |

*Decrease.

### 4 Types of Planes for Scout Work

LONDON, ENG., March 12—Members of the Royal Flying Corps working in scout squadrons, fly four types of service planes at the front. These are the "Spad," the Dolphin, the Sopwith scout plane, and a new model of the Avro, a plane manufactured by A. V. Roe & Co.

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### Quartermaster Contract Awards

WASHINGTON, April 5—Following are contracts placed by the Quartermaster Department for parts for the standardized war trucks:

James McKay Co., Pittsburgh; towing chains.
The Stanley Skid Chains Co., Boone, Iowa; Stanley skid chains.
Walker Mfg. Co., Racine, Wis.; Barrett type jacks.

Rear cross member fillers, body mounting sill intermediate cross members and body mounting sill side members were awarded to the following:

Diamond T Motor Car Co., Chicago.
Brockway Motor Truck Co., Cortland, N. Y.
Republic Motor Truck Co., Alma, Mich.
Service Motor Truck Co., Wabash, Ind.
Garford Motor Truck Co., Lima, Ohio.
Indiana Motor Truck Corp., Marion,, Ind.
Sterling Motor Truck Co., Milwaukee, Wis.
Selden Motor Truck Co., Rochester, N. Y.
Gramm-Bernstein Motor Truck Co., Lima, Ohio.

Orders for body mounting sills for the B trucks went to the Gramm-Bernstein Motor Truck Co., Lima, Ohio.

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### New Ordnance Contracts Coming

WASHINGTON, April 9—The Ordnance Department will soon award contracts for 20,000 four-wheel-drive and 12,000 Nash trucks. It is rumored that these contracts will not be split up but instead will be divided between two or possibly three of the largest companies.

## Chicago Show Proves Greater Used-Car Value

CHICAGO, April 8—Chicago's second annual used-car show has demonstrated the fact that used cars are bringing higher prices this year. A study of the prices paid shows that a car that was a year old last summer sells for about the same price now as in 1917, despite the fact that it is 2 years old at the present time.

The upward trend of prices in the new car field has had much to do with used-car values. The Chicago show also proved the value of rebuilding cars taken in trade. There was hardly a car in the show this year that didn't look as good as new.

Exactly the same number of cars were sold this year as in 1917, but the selling price increased 10 per cent. The attendance in 1918 increased about 15 per cent.

A comparison of this year's and last year's shows follows:

| | 1918 | 1917 |
|---|---|---|
| Cars sold | 219 | 219 |
| Value | $193,775 | $177,045 |
| Attendance (Total) | 18,120 | 15,420 |
| Attendance (Paid) | 3,368 | 7,368 |
| Passes distributed | 1,000,000 | 300,000 |

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### Porter Now Commerce Body

ANN ARBOR, MICH., April 6—The Porter Mfg. Co. has changed its corporate style to the Commerce Body Co., and is extending its business to include the manufacture of truck and trailer bodies on a broader scale.

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### Columbus Tractor Co. to Make "Farmer Boy"

COLUMBUS, OHIO, April 6—The Columbus Tractor Co. has been incorporated to manufacture farm tractors on a large scale. This company is a reorganization of the McIntyre Mfg. Co., maker of the "Farmer Boy" tractor, and is capitalized at $1,000,000. Among the incorporators are Fred W. Miller, John W. Kauffman, W. A. Jones, W. A. Miller, George Barker, F. W. Crawford, E. R. Sharp, D. W. Singleton and Foster Copeland.

Part of the convoy of forty-seven Class B standardized war trucks which received a most enthusiastic reception in Cleveland's Liberty Loan Parade on April 6. The trucks were assembled at the plant of the Gramm-Bernstein Co. in Lima, Ohio, and were being driven overland to the Atlantic seaboard for shipment abroad

# Contracts Entered Into by the Signal Corps Up to March 18, 1918

Ackerman Wheel Co., Cleveland—Landing gears.
Acklin Stamping Co., Toledo—Handley-Page samples.
Aeronautical Engine Corp., Long Island City—Engines.
Aero Accessories Mfg. Co., Brooklyn—Turnbuckles.
Ahnapee Veneer & Seating Co.—Algena, Wis.—Panels.
Aluminum Co. of America, Washington—Tubing.
American Chain Co., Inc., Bridgeport—Cotter pins.
American Metal Hose Co., Waterbury—Tubing.
American Optical Co., Southbridge, Mass.—Goggles.
American Propeller & Mfg. Co., Baltimore—Propellers.
American Rattan & Reed Mfg. Co.—Brooklyn—Rattan.
American Screw Co., Providence—Screws.
American Steel & Wire Co., Washington—Wire.
American Wood Reduction Co., Chicago—Acetate lime.
Barber & Ross, Washington—Propellers.
Barcale Mfg. Co., Buffalo—Belt buckles.
Bastian Blessing Co., Chicago—Hydrogen valves.
Belden Mfg. Co., Chicago—Wire.
Berry Brothers, Inc., Detroit—Spar varnish.
Bickwell-Thomas Co., Greenfield, Mass.—Instruments.
Bosch Magneto Co., N. Y. City—Magnetos.
Breeze Aircraft Co., Inc., Farmingdale, L. I.—Airplanes.
Sidney S. Breeze, N. Y. City—Airplanes.
British Thomas-Houston Co., London, England—Magnetos.
Buffalo Forge Co., Buffalo—Motor armature.
Burd High Compression Ring Co., Rockford, Ill.—Piston rings.
Burdett Oxygen Co., Chester, Pa.—Hydrogen.
Bureau of Mines, Washington—Services.
Burgess Co., Marblehead, Mass.—Hydroairplanes and engines.
Burns & Bassick, Bridgeport—Handley-Page samples.
Albert E. Burr Co., New York City—Cotton fabric.
California Aviation Co., Los Angeles—Airplane spares.
Canadian Aeroplane Co., Toronto, Canada—Airplanes.
Carnie-Goldie Mfg. Co., Kansas City, Kan.—Hangars.
Cavanaugh & McGee Co., N. Y. City—Instruments.
Chamberlain Cartridge & Target Co., Findlay, Ohio—Clay pigeons.
Champion Spark Plug Co., Toledo—Spark plugs.
Chickasaw Lumber Co., Demopolis, Ala.—Lumber.
Chief of Engineers, Washington—Electric primers.
Chief of Ordnance, Washington—Smoke bomb outfits.
A. C. Clark Co., Chicago—Oxygen apparatus.
Columbia Rope Co., Auburn—Rope.
Controller Aeronatuical Supply Co.—London, England—Axle tubes.
Connecticut Aircraft Co., New Haven—Balloons.
Dayton Metal Products Co., Dayton—Services.
Dayton-Wright Aeroplane Co., Dayton—Aeroplanes.
Department Agriculture, Forestry Service, Washington—Lumber.
Des Moines Sawmill Co., Des Moines—Lumber.
Eugene Dietzen Co., New York City—Instruments.
Director Bureau of Mines, Washington—Services.
Doehler Die-Casting Co., Brooklyn, N. Y.—Airplane and engine parts.
Duesenberg Motors Corp., New York City—Engines.
Eastman Kodak Co., Rochester—Cellulose acetate—Cameras.
Electric Magnetic Tool Co., Chicago—Gun Stems.
Electro Metallurgical Sales Corp., New York City—Ferrosilicon.
Empire Art Metal Co., College Point, N. Y.—Airplanes.
Empire Axle Co., Dunkirk, N. Y.—Propeller hubs.
Engle Aircraft Co., Niles, Ohio—Airplane spares.
Ericsson Mfg. Co., Buffalo—Miscellaneous engine parts.
Erie Specialty Co., New York City—Airplane parts.
Excelsior Motor Mfg. & Supply Co., Chicago—Engines.
Firestone Tire & Rubber Co., Washington—Tires.
Fisher Body Corp., Detroit—Airplanes.
Fitzgerald Mfg. Co., Torrington, Conn.—Engine parts.
Flottorp Mfg. Co., Chicago—Propellers.
Follman-Clogg & Co., Lancaster, Pa.—Parachutes.
Foote-Pierson Co., New York City—Wind vanes.
Ford Motor Co., Detroit—Engines-cylinders.
Fowler Aeroplane Corp., San Francisco—Airplanes.
T. C. Foxboro Co., Inc., New York City—Indicators.
French American Balloon Co., St. Louis—Balloons.
Julien P. Friez & Sons, Baltimore—Instruments.
Gallaudet Aircraft Corp., East Greenwich, R. I.—Hydro-airplanes.
Garden City Furniture Co., Chicago.
General Electric Co., Schenectady—Instruments.
General Motors Co., Detroit—Engines.
General Vehicle Co., Long Island City, N. Y.—Real estate—plant.
B. F. Goodrich Rubber Co., Akron—Balloons.
Goodyear Tire & Rubber Co., Akron—Balloons.
Grand Rapids Chair Co., Grand Rapids—Oak.
Henry J. Green, Brooklyn—Instruments.
Hall Scott Motor Co., Inc., San Francisco—Engines and spares.
H. E. Harris Engineering Co., Bridgeport—Gauges.
Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.—Hydro-cylinders.
Hartzell Walnut Propeller Co., Piqua, Ohio—Propellers.
Hartzell Walnut Sales Co., New York City—Propellers.
Haskell Mfg. Co., Ludington, Mich.—Lumber.
A. L. Haustitter, New York City—Instruments.
Hayes-Ionia Co., Grand Rapids—Airplane spares.
Fred G. Hays & Co., Washington—Instruments.
Healy Tool & Appliance Co., Buffalo—Reseaters valves.
Heinze Electric Co., Lowell, Mass.—Magnetos.
McQuay-Norris Mfg. Co., Washington—Piston rings.
Morse Chain Co., Ithaca—Tracings and prints.
Roberts Brass Mfg. Co., Detroit—Elbows.
Pittsburgh Model Eng. Co., Pittsburgh—Engine spares.
Peninsular Milled Screw Co., Detroit—Hex nuts.
Lawrence Aero Eng. Corp., New York City—Engines.
Raymond Mfg. Co., Corry, Pa.—Springs.
Jackson Motor Shaft Co., Jackson, Mich.—Cam shafts.
Lavigne Mfg. Co., Detroit—Drawings.
Lewis & Vought Corp., Long Island, N. Y.—Airplanes.
Riker, New York City—Caustic soda.
U. S. Gauge Co., New York City—Gauges.
Nichols & Cox Lumber Co., Grand Rapids—Lumber.
Norwood Lumber Co., Forney, N. C.—Lumber.
Improved Equipment Co., New York City—Sil. hydrogen gen.
Kraemer & Co., New York City—Lumber.
Martin-Rockwell Corp., New Haven—Gears.
Geo. H. McFadden & Bros., Philadelphia—Cotton.
John A. Roeblings' Sons, Trenton—Wire.
John Boyle & Co., New York City—Ground cloths.
Pittsburgh Reinforced Brazing Mch. Co., Pittsburgh—Chemicals.
Pennsylvania Salt Co., Philadelphia—Chemicals.
McKinnon-Dash Co., Buffalo—Sand bags.
Russell Mfg. Co., Middleton—Shock absorber cord.
Ingersoll Rand Co., New York City—Air compressor and tank.
International Oxygen Co., New York City—Hydrogen.
Queen-Gray Co., Philadelphia—Instruments.
Thos-Morse Aircraft, Ithaca—Airplanes and spares.
Keuffel & Esser Co., Hoboken—Instruments.
Glenn L. Martin—Cleveland—Airplanes.
Taylor Inst. Co., Rochester—Instruments.
Murray & Tregurtha, South Boston, Mass.—Sea sleds.
L. W. F. Eng. Corp., College Point, L. I.—Airplanes.
James V. Martin Aero Co., Elyria, Ohio—Airplanes.
N. Y. Aero. Constr. Co.—Airplanes.
Nat'l Electrical Sup. Co., Washington—Wire pikes.
I. T. Man, New York City.
Pigeon Frazer, Boston—Model body.
Nelson Blower & Ferru Co.—Instruments.
Nordyke-Marmon Co., Indianapolis—Engines.
Lang Prop. Co., New York City—Engine and airplane parts.
Mass. Inst. of Tech., Cambridge—Services.
Precision Inst. Co., Detroit—Air speed indicators.
Lincoln Motor Corp., Detroit—Engines.
Ordnance Dept.—Ammunition.
Ordnance and Inst. Sect.—Mach. guns.
Rubay Co., Cleveland—Airplane spares.
Lewis-Thompson Co., Philadelphia—Mahogany logs.
Norman W. Henly Publishing Co., New York City—Charts.
Henrix, Luebert & Co., San Francisco—Hangars, tents.
Hercules Powder Co., Wilmington, Del.—Dynamo.
Herz & Co., New York City—Grip rings.
The Hess Bright Mfg. Co., Philadelphia—Ball bearings.
Hettrick Manufacturing Co., Toledo—Ground cloths.
Hooker Electrical Chemical Co., New York City—Soda.
The Hughes Owens Co., Ltd., Montreal, Canada—Instruments.
U. T. Hungerford Brass & Copper Co., New York City—Rivets.
Edward W. Hunt, Gautemala, C. A.—Mahogany.
E. G. Budd Mfg. Co., Philadelphia—Handley-Page sample.
Federal Adding Machine So., New Haven—Handley-Page sample.
Stewart-Hartshorn Co., East Newark, N. J.
W. E. & L. E. Curley & Co., Troy—Instruments.
Curtiss Screw Works, Buffalo—Screws.
Detroit Sulphite Pulp & Paper Co., Detroit—Gaskets.
Champion Ignition Co., Flint—Spark plugs.
Corbin Screw Co., New Britain, Conn.—Screws.
Chas. A. Bigelow, Bay City—Lumber.
Burdett Mfg. Company, Philadelphia—Oxygen.
Metz Company, Waltham, Mass.—Airplane spares.
W. H. Mullins Co., Salem, Ohio—Airplane spares.
Tenn. Valley Iron & R. R. Co., Pittsburgh—Acetate lime and alcohol.
K. Kaufman & Co., Newark, N. J.—Instruments.
W. H. Gear, Philadelphia.
The Precision Casting Co., Syracuse—Venturi tubes.
Radium Luminous Material Corp., New York City—Dials and pointers.
Radium Dial Co., Pittsburgh—Dials and pointers.
Turney, Halsey Co., New York City—Duck No. 8.
Lawton Mills Co., New York City—Bal. cloth.
International Register Co., Chicago—Wind vane sights.
Imperial Furniture Co., Grand Rapids—Oak.
Loening Aeronautical Eng. Corp., Long Island City—Airplanes.
Reddis Lumber & Veneer Co., Marshfield, Wis.—Panels.
Talge Mahogany Co., Indianapolis—Panels for spad planes.
Frederick Pearce Co., New York City—Scarf mounts.
The Parkersburg Mill Co., Parkersburg—Poplar.
Peierl Buhler Co., New York City—Fabric.
King Inst. Co., New York City—Instruments.
U. S. Industrial Chemical Co., Baltimore—Acetone.
Mulconroy Co., Philadelphia—Braided hose.
Macey Engineering Co., Franklin, Pa.—Elect. control.
Union Switch & Signal Co., Swissvale, Pa.—Engines.
Fritz Lowenstein, Brooklyn—Spark gap.

National Tube Co., Pittsburgh—Hydrogen cylinders.
Ponemah Mills, New York City—Airplane fabric.
Lortex Co., New York City—Fabric.
Pierce Mfg. Co., New Bedford, Mass.—Airplane fabric.
Nat'l Cash Register Co., Dayton—Tachometers.
Pittsburgh Test Lab'rs, Pittsburgh—Services.
National Lumber & Mfg. Co., Hequian, Wash.—Lumber.
Nehalem Saw Mill & Box Factory, Nehalem, Ore.—Lumber.
Prouty Lumber & Box Co., Seaside, Ore.—Lumber.
Oregon Box Mfg. Co., Portland, Ore.—Lumber.
Mineral Lake Lumber Co., South Bend, Wash.—Lumber.
Harrison Mills Co., Bellingham, Wash.—Lumber.
Pigeon Frazer H. S. Co., Boston—Airplanes.
Thomas Morse Aircraft, Ithaca—Airplanes.
Glenn L. Martin, Cleveland—Airplanes.
W. R. Mathew & Son, New York City—Guy anchors.
Russell Mfg. Co., Middletown, Conn.—Parachute harnesses.
Oxygen Gas Co., Kansas City—Wire thimbles.
McKeon Motor Car Co., Omaha—Windlass.
Packard Motor Car Co., Detroit—Engines.
U. S. Aircraft Corp., Redwood City, Cal.—Airplanes.
Newark Tube & Metal Co., Newark, N. J.—Handley Page samples.
U. S. Cartridge Co., Lowell, Mass.—Ammunition.
Kessler Motor Co., Detroit—Engine parts.
Lewis Spring & Axle Co., Chelsea, Mich.—Airplane spares.
Pittsfield Spark Coil Co., Pittsfield, Mass.—Spark plugs.
Murray & Tregurtha Co., South Boston—Sea sleds.
Rajah Auto Supply Co., Bloomington, N. J.—Terminals.
Liberty Iron Works, Sacramento—Airplanes.
Nordyke & Marmon, Indianapolis—Engines.
G. E. Taylor, Rochester—Instruments.
Riley Scott—Dummy bombs.
Ordnance Mfg. Corp., New York City.
Laminated Shim Co., New York City—Sheet brass.
Lawrence Engine Corp.—Engines.
The National Acme Co., Cleveland—Hex nuts.
Pitsburgh Model Eng. Co., Pittsburgh—Engine spares.
Rich Tool Co., Chicago—Engine parts.
U. S. Ball Bearing Co., Chicago—Ball bearings.
Tariffville Oxygen & Chem. Co., Tariffville, Conn.—Hydrogen.
International Oxygen Co., New York City—Hydrogen.
Lewis Mfg. Co., Walpole, Mass.—Cheese cloth.
W. H. LeBrun, Depot Co., Kan.—Protar lens.
Torchweld Equipment Co., Chicago—Hose clamps.
Metal Products Co., Detroit—Airplanes.
Maddox Table Co., Jamestown, N. Y.—Propellers.
International Register Co., Chicago—Wind vane sights.
John A. Roebling's Sons Co., Trenton, N. J.—Wire.
Western Paper Box Co., Detroit—Paper gaskets.
Westinghouse Electric & Mfg. Co., Pittsburgh—Telephones, supplies.
Wm. Whitman & Co., Inc., New York City—Airplane fabric.
William Test Clamp Co., Cleveland—Connectors.
Wilson Foundry Co., Pontiac—Engines.
Winchester Repeating Arms Co., New Haven—Ammunition.
Wing & Evans, New York City—Caustic soda.
Winkler & Bro. & Co., New York City—Caustic soda.
Wolverine Brass Works, Grand Rapids—Scarf ring mounts.
Wright-Martin Aircraft Corp., New York City—Airplanes, engines.
Ypsilanti Reed Furniture Co., Ionia, Mich.—Balloon baskets.
Zenith Carburetor Co., Detroit—Carbureters.
Curtiss Aeroplane & Motor Corp., Buffalo—Airplanes and spares.

### Mineral Researches Co-ordinated

WASHINGTON, April 8—A joint board has been organized to serve as a clearing house for information regarding minerals and mineral products. It is styled the Joint Information Board on Mineral and Derivatives and is composed of representatives from each of the cabinet departments and the War Industries Board: the Fuel Administration, Shipping Board, War Trade Board, Tariff Commission, U. S. National Museum, Federal Trade Commission, National Research Council and Railroad Administration.

At present, each of these various departments have individuals and divisions whose activities include research or use of minerals and mineral derivatives. The joint board will, in future, co-ordinate these activities. Pope Yeatman, of the War Industries Board, Division of Raw Materials, is the chairman of the joint board. Edson S. Bastin is the secretary of the joint board with offices in the New Interior Building, Washington.

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### Loaded 5-Ton Trucks Not Barred

NEW YORK, April 8—The teeth of the Hewitt "Highways Protective Measure" have been extracted. As originally introduced, the measure would have barred from the New York state highways all commercial vehicles which with their loads weighed in excess of ten tons. Following portests by members of the National Automobile Chamber of Commerce, dealers all over the state and the Motor Truck Club, Senator Hewitt and the highway department have agreed to raise the limit to 25,000 lbs. The amended bill is to be introduced to-day and in all probability will pass with this limit. This means that the bill no longer has the sting which it had. In other words it will not bar five-ton trucks fully loaded, which apparently was the original intention, and will prevent the passage of only a limited number of very heavy loads, such as might be moved by contractors using trailers or semi-trailers.

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### Forty Oakland Cars Driven to Coast

PONTIAC, MICH., April 6—A fleet of forty Oakland cars left the plant yesterday, bound for the Nattrass & Harris Motor Co., Ltd., of Wellington, New Zealand. They will be driven over the road to New York, where a crew of workmen will box and crate them for their 13,000-mile ocean voyage to New Zealand. The trip will take between 30 and 40 days.

## Automotive Securities Quotations on the New York and Detroit Exchanges

| | Bid | Asked | Net Ch'ge |
|---|---|---|---|
| *Ajax Rubber Co. | 53 | 55 | .. |
| *J. I. Case T. M. Co. pfd. | 83 | 86 | .. |
| Chalmers Motor Co. com. | 6 | 8 | .. |
| Chalmers Motor Co. pfd. | 30 | 40 | .. |
| *Chandler Motor Co. | 82 | 85 | +3 |
| Chevrolet Motor Co. | 119 | 120 | .. |
| *Fisher Body Corp. com. | 33 | 35 | +1 |
| *Fisher Body Corp. pfd. | 76 | 83½ | —3½ |
| Fisk Rubber Co. com. | 50 | 53 | .. |
| Fisk Rubber Co. 1st pfd. | 98 | 103 | .. |
| Fisk Rubber Co. 2nd pfd. | 70 | 75 | .. |
| Firestone Tire & Rubber Co. com. | 92 | 95 | +1 |
| Firestone Tire & Rubber Co. pfd. | 96 | 98 | .. |
| *General Motors Co. com. | 118 | 121 | +2½ |
| *General Motors Co. pfd. | 80½ | 82 | —1 |
| *B. F. Goodrich Co. com. | 43½ | 45 | +3 |
| *B. F. Goodrich Co. pfd. | 99½ | 100½ | +1½ |
| Goodyear Tire & Rubber Co. com. | 136 | 139 | +1 |
| Goodyear Tire & Rubber Co. pfd. | 97 | 99 | +1 |
| Grant Motor Car Corp. | 3 | 4 | .. |
| Hupp Motor Car Corp. com. | 3 | 3½ | .. |
| Hupp Motor Car Corp. pfd. | 84 | 88 | —2 |
| International Motor Co. com. | 22 | 26 | .. |
| International Motor Co. 1st pfd. | 52 | 58 | +2 |
| International Motor Co. 2nd pfd. | 23 | 28 | +1 |
| *Kelly-Springfield Tire Co. com. | 41 | 43 | —1 |
| *Kelly-Springfield Tire Co. 1st pfd. | 75 | 85 | .. |
| *Lee Rubber & Tire Corp. | 12¼ | 13½ | + ½ |
| *Maxwell Motor Co., Inc., com. | 25½ | 27 | — ½ |
| *Maxwell Motor Co., Inc., 1st pfd. | 53 | 54 | —1 |
| *Maxwell Motor Co., Inc., 2nd pfd. | 19½ | 22 | +1½ |
| Miller Rubber Co. com. | 108 | 112 | —3 |
| Miller Rubber Co. pfd. | 96 | 98 | —1 |
| Packard Motor Car Co. com. | 92 | 97 | .. |
| Packard Motor Car Co. pfd. | 89 | 92 | .. |
| Paige-Detroit Motor Car Co. | 17 | 18 | .. |
| Peerless Truck & Motor Corp. | 14 | 16 | .. |
| Portage Rubber Co. com. | 104 | 107 | —2 |
| Reo Motor Car Co. | 16 | 17 | .. |
| *Saxon Motor Car Corp. | 6 | 9 | .. |
| Standard Motor Construction Co. | 12½ | 13 | — ½ |
| *Stewart-Warner Sped. Corp. | 54 | 56 | +1 |
| *Studebaker Corp. com. | 40½ | 41½ | +2 |
| *Studebaker Corp. pfd. | 80 | 90 | —1 |
| Swinehart Tire & Rubber Co. | 25 | 40 | .. |
| United Motors Corp. | 25¾ | 26 | — ¼ |
| *U. S. Rubber Co. com. | 54¼ | 56 | +1 |
| *U. S. Rubber Co. pfd. | 103 | 105 | +1 |
| *White Motor Co. | 42 | 43 | + ½ |
| *Willys-Overland Co. com. | 17½ | 18½ | + ½ |
| *Willys-Overland Co. pfd. | 79 | 81 | —1½ |

*At close April 6, 1918. Listed N. Y. Stock Exchange.

### OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

| ACTIVE STOCKS | Bid | Asked | Net Ch'ge |
|---|---|---|---|
| Auto Body Co. | .. | 8 | .. |
| Bower Roller Bearing Co. | 17 | .. | .. |
| Chevrolet Motor Co. | 118 | 120 | +4 |
| Commerce Motor Car Co. | .. | 10½ | .. |
| Continental Motor Co. com. | 5¼ | 5⅝ | — ¼ |
| Continental Motor Co. pfd. | 91 | 93½ | —1½ |
| Edmunds & Jones com. | 15 | 17 | .. |
| Edmunds & Jones pfd. | 75 | 85 | .. |
| Ford Motor Co. of Canada | 202 | 206½ | +2 |
| Hall Lamp Co. | 13½ | 14 | .. |
| Michigan Stamping Co. com. | 13⅜ | 13¾ | + ⅞ |
| Motor Products | .. | .. | .. |
| Packard Motor Car Co. com. | 92 | 96 | +2 |
| Packard Motor Car Co. pfd. | 89½ | 91¾ | —8½ |
| Paige-Detroit Motor Car Co. | 17¼ | 18 | + ¾ |
| Prudden Wheel Co. | 12½ | .. | +1⅛ |
| Reo Motor Car Co. | 15⅞ | 16¼ | — ¼ |
| **INACTIVE STOCKS** | | | |
| Atlas Drop Forge | .. | 27¼ | .. |
| Kelsey Wheel Co. | 90 | 92 | .. |
| Regal Motor Car Co. | .. | .. | .. |

## Ford Experimenting on Rifle Steel and Boring

DETROIT, April 5—It is reported that the Ford Motor Co. is experimenting on steel and boring for rifle barrels. Officials of the company decline to discuss the matter, and it is not known whether the company is conducting this work on its own account with a view to offering rifle-manufacturing facilities to the Government, or whether it is working at the request of the Government.

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### Kant-Miss Plug in Production

GREEN BAY, WIS., April 9—The Kant-Miss Spark Plug Co., organized several months ago with a capital stock of $100,000, has completed arrangements for quantity production of the plug. The company has been manufacturing these in limited numbers for some time.

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### Myers Machine to Increase Production

SHEBOYGAN, WIS., April 8—The Myers Machine Co., which has been manufacturing commercial cars trade-marked "Wisconsin" for the last year and a half, is completing arrangements for increasing its output. A new model, of 2½ tons' capacity, styled Model C, is now in production in addition to Model B, a 1½-ton vehicle, on which the concern heretofore has concentrated.

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### Special Machinery for U. S. Contracts

LANSING, April 8—The Auto Wheel Co. and the Prudden Wheel Co. are installing new machinery to handle Government contracts amounting to $3,000,000 for escort wheels. Additions to the seasoning departments were also made in both plants.

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### F. W. D. Truck Plant Ready

WEBBERVILLE, MICH., April 6—The plant of the Four Wheel Drive Truck Co., organized recently, has been completed and the manufacture of the first 2-ton truck is under way. The officers of the company are: President and assistant treasurer, Ashmon Catlin; secretary and manager, Frank Young; vice-president, F. D. Welfare; treasurer, W. W. Thorburn.

—

### Ampco Bronze Gets Globe Iron Plant

MILWAUKEE, April 8—The Ampco Rolling Mills Corp. is remodeling the plant of the Globe Iron Works, Menominee, Wis., which it recently acquired, into a foundry, wire and rolling mill. The company will manufacture Ampco bronze products in the plant including wire and cable, bronze gears and shafts.

—

### Piano Factories to Make Airplanes

WASHINGTON, April 6—The War Industries Board yesterday reached an agreement with piano industries to curtail production 30 per cent in April and May so as to create additional facilities for aircraft work which the piano factories will take up. Priority orders have been issued in favor of lumber shipments from sawmills to the piano factories which will manufacture airplanes.

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## Current News of Factories

*Notes of New Plants—Old Ones Enlarged*

### Stewart-Warner Making Grenades

BELOIT, WIS., April 9—The plant of the Stewart-Warner Mfg. Co. here is manufacturing hand grenades, rifle grenades and trench mortar fuses for the U. S. Army. Work on the contract began in December, but the maximum output, which will now be maintained for an indefinite period, was not reached until March. More than 4000 hand grenades are being made daily.

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### Furniture Company Making Airplane Parts

GRAND RAPIDS, April 8—A new 3-story addition to the Luce Furniture Co., to be used in the construction of airplane parts, has been completed.

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### Dort Gets Government Order

FLINT, April 8—The Dort Motor Car Co. has received a Government order for 1700 trailers of the 2-wheel type. It is expected that delivery will start May 1.

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### Addition for West Bend Aluminum

WEST BEND, WIS., April 8—The West Bend Aluminum Co., West Bend, Wis., will award contracts this week for the erection of a 3-story shop addition, 70 x 200, and a 1-story addition, 60 x 60.

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### Jordan Increases Capital $200,000

CLEVELAND, April 6—The Jordan Motor Car Co. has increased its capital stock $200,000. The production of the company is 7 cars a day, 20 per cent of the output being driven away.

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### Dividends Declared

The Paige-Detroit Motor Car Co. has declared the regular monthly dividend of 1 per cent on common stock, payable April 10 to stock of record April 1.

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The Willys-Overland Co. has declared the regular quarterly dividend of 25 cents a share on common stock, payable May 1 to stock of record April 15.

—

The Stanley Motor Carriage Co. has declared a regular quarterly dividend of 1¾ per cent on preferred stock, payable April 1 to holders of record March 20.

—

The Kelly-Springfield Tire Co. has declared a quarterly dividend of $1 a share on common stock, payable May 1 to holders of record April 15.

## Milwaukee Raises $100,000 for Lawson Aircraft Corp.

MILWAUKEE, April 9—More than $100,000 has been subscribed already toward the total of $500,000 being sought here to finance the Lawson Aircraft Corp., Green Bay, Wis. This company is being organized to handle government contracts for airplanes and will be moved shortly to Milwaukee. Plans are being completed to provide a central assembling plant.

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### Racine Plant for Wohlrab Gear

RACINE, WIS., April 8—The Wohlrab Gear Co. has completed arrangements for a factory here, in which output will be greatly increased. The company has leased the plant of the former Secor Trunk Co., together with a large steam generating plant, and has taken options on other buildings of the Secor group. Alterations are being made, and machinery installed. The Wohlrab company has been manufacturing gears in the plant of the Wisconsin Engine Co., Corliss, Wis.

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### Falls Machine Building Addition

SHEBOYGAN FALLS, WIS., April 6—The Falls Machine Co. is erecting an addition to provide additional facilities in the manufacture of airplane and army truck engines. The company recently received a contract for building standardized truck engines, which will be supplied to the Kissel Motor Car Co., Hartford, Wis.

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### Wolverine Tractor Buys Land

SAGINAW, MICH., April 6—The Wolverine Tractor Co., which was organized in Detroit about 2 years ago with a capital stock of $300,000, has bought 40 acres of land for a tractor factory. The principal stockholder is W. E. Wood, head of the W. E. Wood Construction Co., Detroit.

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### Ford to Make 3 Eagles a Day

WASHINGTON, April 5—Henry Ford has assured Secretary Daniels that the first "Eagle," the new supersubmarine chaser, will be launched in June and that under stress it will be possible to turn out 3 a day. Under present plans Ford intends to launch one boat a day. Secretary Daniels recently visited the Detroit Ford plant and inspected the first pattern boat.

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### Canadian Leonard Is Separate

JACKSON, MICH., April 5—The Leonard Tractor Co. of Canada, Ltd., is an entirely separate company from the Leonard Tractor Co. of Jackson, Mich., and is not a subsidiary of it, as was mentioned in AUTOMOTIVE INDUSTRIES recently. The Canadian company operates on a royalty basis and H. M. Leonard, president of the Jackson company, is not an officer of the Canadian company.

# Men of the Industry

*Changes in Personnel and Position*

## J. D. Maxwell Joins the Automotive Products Section

WASHINGTON, April 10—J. D. Maxwell, president of the original Maxwell Motor Co., has joined the Automotive Products Section of the Council of National Defense, where he will work with Harry L. Horning. Mr. Maxwell, who has been living in retirement for several years, was the designer of the Northern, and later the Maxwell cars manufactured by the Maxwell-Briscoe Co. He will come to Washington to assume his new duties in the near future.

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**F. A. Bower**, formerly chief engineer of the Weston-Mott Co., Flint, Mich., has been appointed engineer of the Buick Motor Co., Flint.

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**E. P. Smith**, formerly engineer of the Hercules Motor Mfg. Co., Canton, Ohio, has joined the engineering department of the Garford Motor Truck Co., Lima, Ohio.

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**H. S. McClellan** has been appointed superintendent of Plant 1 of the Buick Motor Co. at Flint, Mich. He was formerly general superintendent of the Chalmers Motor Co., Detroit.

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**J. A. Kingsbury**, metallurgist, formerly with the Studebaker Corp., has become associated with the Trego Motors Corp. at New Haven, Conn.

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**C. O. Olson**, for 2 years auditor of the Maxwell Motor Sales Corp., Detroit, has been appointed manager of the company's branch at Youngstown.

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**William H. Noyes** has been made manager of the retail department of the Cleveland Rubber Corp., Cleveland. Until recently he was service manager of the Oldsmobile in Cleveland.

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**C. E. Richards**, formerly manager of the New York office of the Braender Rubber & Tire Co., Rutherford, N. J., has been appointed assistant tire sales manager of the Rubber Insulated Metals Corp., Plainfield, N. J.

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**Langdon A. Smith**, until recently general eastern supervisor of the Maxwell Motor Sales Corp., Detroit, has been promoted to the position of assistant to the director of sales.

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**Edward Maurer** has resigned as chief engineer of the Lewis Spring & Axle Co., Chelsea, Mich., and has been appointed superintendent of shops of the Solvay Process Co., Detroit.

**Charles A. Clark**, formerly with the Knox Tractor Co., and more recently with the Gramm-Bernstein Company, has been appointed eastern district sales manager of the Acason Motor Truck Co., Detroit. He will have charge of all eastern territory, with headquarters in Boston.

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**H. T. Melhuish** has succeeded E. E. Vreeland as advertising manager of the Fulton Motor Truck Co., Farmingdale, L. I.

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**Joseph C. Weston** has been elected vice-president of the United States Tire Co., New York. When the company was formed, he was appointed manager of the Pacific Coast division, and was later made general sales manager at the New York office.

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**J. E. Eckenrode** has been appointed central district sales manager of Fuller & Sons Mfg. Co., Kalamazoo, Mich., with headquarters in Detroit, to succeed Gould Allen, who resigned.

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**L. C. Reynolds**, formerly manufacturing superintendent of the General Vehicle Co. of Long Island City, has joined the General Motors Co. in Detroit.

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**G. A. House** has resigned as sales manager of the Auto Wheel Co., Lansing, and has been appointed sales manager of the Hayes Wheel Co., Jackson.

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**Robert W. Stanley**, formerly affiliated with the Entz Motor Patents Corp., New York, has been appointed chief engineer and production manager of the Bourne Magnetic Truck Co., Philadelphia.

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**C. B. Franklin** of the Hendee Mfg. Co., Springfield, Mass., has been in Washington since work was begun on the U. S. A. motorcycle, and has taken an active part in the design of the machine. The work of inspecting motorcycle equipment for acceptance at various plants throughout the country has devolved largely upon Captain H. J. Lawes, Q. M. C.

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### William J. Harvey Dies

RACINE, WIS., April 8—William J. Harvey, founder and president of the Harvey Spring & Forging Co., died last week. In 1889, he organized the Harvey Spring Co. to manufacture vehicle springs, and later enlarged it to include a general line of motor car and truck forgings. It was at this time that he changed the style of the company to the Harvey Spring & Forging Co.

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### Robert Perkins Dies

DETROIT, April 8—Robert Perkins, former president of the Massnick-Phipps Co., has died. He was a pioneer in bicycle days, and started the Corbin Motor Vehicle Co., of New Britain, Conn. He came to Detroit in 1906 to become factory manager of the Gemmer Co., later buying the controlling interest of the Massnick-Phipps Co. He was 61 years old.

# New Companies Formed

*Latest additions to ranks of Automotive Industries*

## Wisconsin Company to Make Starter-Inflator

GREEN BAY, WIS., April 8—The Lauchin Air-Starter & Tire Inflator Co. has been organized at Green Bay, Wis., with a capital stock of $50,000 to manufacture a combination engine starting and tire pumping device. This was designed and patented by George Y. Lauchin. Arrangements have been completed for a factory and materials have been purchased for an initial output of 500 pumps. The starter-inflator can be used for any make of car. All of the capital stock of the company has been absorbed locally. Officers are: President, Joseph F. Rothe; vice-president, Anton Loehr, Hilbert, Wis.; secretary, R. B. Vockery; treasurer, John J. Madler, Hilbert; general manager, George Y. Lauchin.

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### American Truck Buys Blair Co.

NEWARK, OHIO, April 9—The American Motor Truck Co. has purchased the real estate, buildings, equipment, stock and other assets of the Blair Motor Truck Co. and has incorporated for $1,500,000, two-thirds of which sum is in preferred stock. The company will manufacture 2½,- 3½- and 5-ton capacity trucks which will be substantially the same as those heretofore produced by the old company, except that the rear axles will be strengthened. The trucks will be styled American. The company is preparing to put trucks through on a large production basis, and expects to turn out from 1000 to 1200 trucks a year. The officers of the company are: J. D. Potter, president and general manager; Erwin Philips, vice-president and production manager; E. B. Alspach, secretary and treasurer; A. E. Shrimpton, superintendent, and F. M. Blair, chief engineer.

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### Moon Heads Ohio Trade

COLUMBUS, OHIO, April 10—Victor Moon has been appointed commissioner of the Ohio Automobile Trade Assn. He was formerly connected with the Toledo Rubber Co. and succeeds W. A. McCurdy, who is State Automobile Registrar and who resigned because of the press of other duties.

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### Aldrich Named Kissel Distributer

BOSTON, April 6—The Kissel Motor Car Co. turned over practically all of the New England territory to William F. Aldrich to-day. The Hinchcliffe Motor Car Co., which handled the Kissel and the Jordan, gave up the Kissel line some time ago, retaining the Jordan.

# Industrial Review of the Week

## A Summary of Major Developments in Other Fields

### Increased Output of Coal Despite Shortage of Labor

From the anthracite fields come encouraging reports of increased outputs, notwithstanding the shortage in labor, which promises to become more serious because of the new draft call the latter part of this month. The available labor supply in the hard coal regions is so utterly inadequate that operators are asking for the exemption of their workers on the ground that their services are urgently needed to keep up production. Anthracite is now moving freely to all points of consignment. To further aid in the distribution of coal and to prepare for what will surely be a record-breaking summer, some of the anthracite operators are building new washeries and rearranging old breakers to permit of the loading of 50-ton cars instead of the 25 and 30-ton cars formerly loaded.

As yet there has been no decision regarding the prices of steam coals, and all sales of these grades are being made at the prices which prevailed last year. It is generally believed that the Government will fix the prices on these coals and that this decision will come when the contracts which have been drawn up and sent to the Fuel Administration for approval are acted upon.

Production of bituminous coal continues to be disappointing. To such an extent has the car shortage interfered with the operation of the mines that the miners are becoming restive over their reduced working time. It was hoped that the elimination of most of the priority orders in the central Pennsylvania region would favorably affect the car situation, but this is not proving to be the case.

John Skelton Williams, in charge of purchases for the railroads, is insisting that the roads be permitted to buy their fuel at much lower prices than those specified in the official schedule. Thus we are confronted with the amazing spectacle of one Government activity setting at naught the edicts and rulings of another Government activity.

The Fuel Administration asserts that coal should be furnished to all consumers, whether large or small, at the same price. The railroad officials refuse to accept Dr. Garfield's ruling under the plea that to do so would add millions of dollars to the railroads' coal bill.

In the past conditions were such that the roads, which take a large percentage of the entire coal production of the country, could not be prevented from securing their coal at cost, or below cost, and industrial consumers paid the difference. Now that the railroads are under Government control no valid reason exists for an adherence to the old policy. However, this practice is still being followed by the railroads, which in many instances have refused to supply cars to mines until "satisfactory" prices have been quoted for railroad fuel. There is a little contract activity, though only the larger concerns are afforded the opportunity of closing contracts, which are made as a matter of policy. On such agreements as have been closed the Fuel Administration is slow to mark its approval, a fact which is causing uneasiness among some consumers.—*Coal Age.*

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#### Detroit Responds Promptly to Liberty Loan

DETROIT, April 9—At noon to-day, the second day of the third Liberty Loan drive, Detroit has reached a total of $23,000,000 of $36,000,000 quota. The automobile and parts manufacturers in this territory gave prompt response to the loan, and before the drive is over it is expected that a record will be set by the industrial concerns in this vicinity which will place the city and the surrounding territory among the leaders of the country in oversubscription.

The subscription by the Henry Ford interests for $6,000,000 heads the list, but the number of small purchases exceeds in the aggregate the total bought by the larger companies. Dodge Brothers subscribed for $1,000,000, Packard Motor Car Co., $600,000; Lincoln Motor Co., $500,000. The list of some of the industrial concerns which have subscribed in this territory follows:

| | |
|---|---|
| Henry Ford and interests | $6,000,000 |
| Great Lakes Engineering Works | 1,000,000 |
| Dodge Brothers | 1,000,000 |
| Packard Motor Car Co. | 600,000 |
| Fisher Body Corp. | 500,000 |
| Lincoln Motor Co. | 500,000 |
| Hudson Motor Car Co. | 400,000 |
| Cadillac Motor Car Co. | 400,000 |
| Maxwell Motor Co. | 350,000 |
| Solvay Process Co. | 300,000 |
| Detroit Copper & Brass Rolling Mills | 250,000 |
| Charcoal Iron Co. of America | 250,000 |
| Burroughs Adding Machine Co. | 250,000 |
| Detroit Shipbuilding Co. | 200,000 |
| Timken-Detroit Axle Co. | 200,000 |
| Sement-Solvay Co. | 200,000 |
| J. F. Ford Co. | 150,000 |
| Detroit & Cleveland Navigation Co. | 100,000 |
| Northway Motor Co. | 100,000 |
| Detroit Steel Products Co. | 100,000 |
| Morgan & Wright | 100,000 |
| Michigan Smelting & Refining Co. | 100,000 |
| Detroit Iron & Steel Co. | 100,000 |
| Buhl Malleable Co. | 100,000 |
| Hayes Manufacturing Co. | 100,000 |
| Edmunds & Jones Corp. | 75,000 |
| Detroit United Railway | 75,000 |
| Detroit Stove Works | 50,000 |
| Peninsular Stove Works | 50,000 |
| Michigan Stamping Co. | 50,000 |
| Motor Products Corp. | 50,000 |
| Roehm & Davison | 50,000 |
| General Aluminum Brass Co. | 50,000 |
| Continental Motors Corp. | 40,000 |
| Jeffery-DeWitt Co. | 25,000 |
| Detroit Lubricator Co. | 25,000 |

Two Michigan cities which oversubscribed their quotas on the first day were Lansing and Mt. Pleasant. Both are in counties that have also oversubscribed their quotas. Ingham county, in which Lansing is situated, more than doubled its quota.

### Artillery Program Helps Iron and Steel Industry

The most significant development of the week is the definite shaping of Government plans for the immediate building of larger gun works than the United States has to-day and for a corresponding increase in the manufacture of the largest shells at new plants. The new artillery program will include many 16-in. howitzers mounted on trucks. Their manufacture is likely to be undertaken by a great interest not now engaged on guns, and deliveries are not counted on before late 1919 or early 1920.

This first week of the country's second year in the war is thus marked by the clearest indications yet given that American steel output will at length be so far taken up by the Government and its Allies as to leave little for so-called ordinary uses either at home or abroad.

Steel mills have been under pressure from Washington in the past week in an effort to have January and February shortages made up, particularly those in plates. The mills have had the help of a better car supply, which in the Pittsburgh district has been especially fortunate in view of the large proportion of output required by the Government. The leading producer there has turned nearly 90 per cent of its recent production into Government and war contract channels, and several plants in the same district that lately have given 60 to 75 per cent of their production to such business are now considerably exceeding these figures.

Great Britain's call for 300,000 tons of ship steel is growing more urgent, and for part of this special consideration has been ordered. A large order of shell steel for the Allies is also awaiting distribution. Meantime an arrangement has been made under which the inquiries of Canadian roads for 285,000 tons of rails will be withdrawn from the market. Much of this will be placed in Canada and mills here will relieve those in Canada of a large quantity of shell steel.

Every week's delay in the placing of the 100,000 cars that have long been scheduled at Washington increases the chances of repeating next winter the disastrous traffic breakdown of January and February. Should these orders be given out to-morrow, weeks would be required for the manufacture of car appliances on which plants partly idle should now be at work.

Steel ingot production in March is estimated at more than 3,525,000 tons, on the basis of returns from 29 companies making 85 to 90 per cent of the total. This represents an increase of 30 per cent over the average for January and February, and is parallel with the remarkable recovery in pig-iron production.—*Iron Age.*

## Fewer Drive-aways As Freight Cars Increase

DETROIT, April 8—Many manufacturers in this territory have been fortunate in obtaining more freight cars of late. This has reduced the percentage of drive-aways somewhat, but the less fortunate manufacturers have been increasing their drive-aways.

Few freight cars are being used for transportation to nearby cities. Usually cities within a 300-mile radius of the factory are forced to drive cars away, releasing freight equipment for more distant points. The average number of cars driven from the Briscoe plant is 15 daily. The biggest drive-away, consisting of 30 cars, went to Memphis.

The Reo Motor Car Co. is asking all dealers to drive away trucks, and most of the Eastern dealers are working on a schedule. As soon as they arrive at their home towns with a train of vehicles they immediately take a train back to the factory and start again with another. An Atlanta dealer took 50 trucks from the factory and a train of 20 went to San Antonio last week. Thirty were driven to Oklahoma City.

Willys-Overland drive-aways average 300 cars a day. Last week the most notable events were the departure of a fleet of 107 cars for North Carolina and one of 30 cars for Parsons, Kan.

The Denby Motor Truck Co. has a weekly schedule with New York, Washington, Boston and other Eastern points. Some of the trucks are loaded to capacity with government supplies. The average daily drive-away is 6 trucks.

Of the Cadillac production 40 per cent is driven away. In making big drive-aways from the Hupp Motor Car Corp., it was found advisable to divide the train into groups of 10 men each, with a captain for each group, who is responsible for its safe arrival. A coating of vaseline is given the cars before they depart to protect the finish.

It has been brought to the attention of manufacturers that drivers are not heeding the instructions given them. After they pass the city's boundary many of them are inclined to speed the machines.

A joint letter is being prepared by the Detroit Automobile Club, the Monroe Chamber of Commerce and the Toledo Automobile Club to be sent to all the manufacturers in this territory asking them to caution drivers taking cars from the factory not to exceed a speed of 30 m.p.h. Nearly all the manufacturers are now cautioning drivers to limit themselves to a speed of 18 m.p.h., but complaints are being made that many exceed a speed of 40 miles.

It is pointed out that dealers should use care in selecting capable and reliable men for drive-aways. Illustrating what may happen on a drive-away where a high speed is attained this instance is cited: A train of 16 cars was running at a speed of more than 40 m.p.h., cars being only 4 or 5 ft. apart. The leader suddenly stopped at a railroad crossing, causing all of the following cars to jam their radiators. Drivers are often inclined to hog the road at dangerous speed. One driver refused to turn in until he nearly touched an approaching car. The latter, to avoid an accident, swung into the ditch, and the factory driver escaped with little injury when his car turned over in the opposite ditch.

Monroe has. for the last month, been fining speeders at the rate of 10 to 15 a day.

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### Airplane Mail Service in Russia

WASHINGTON, April 9—A report has been received from Russia that the first airplane mail experiment from Petrograd to Moscow, a distance of 400 miles, was successful. The trip was made in 5½ hours, and 300 lbs. of mail were carried. Four airplanes now fly daily in both directions, and service to other cities is contemplated. The postage fee is $1 per letter.

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### Royal Flying Corps Men Leave Texas

WASHINGTON, April 8—The members of the British Royal Flying Corps training in this country at the invitation of the U. S. government here are returning to Canada to-day. The three fields at Fort Worth will henceforth be devoted to training for Americans. The situation whereby the Canadians trained in the U. S. was an unusual one and directly contrary to some well-established precedents, but was carried on as a return courtesy for the British invitation last summer to Americans to train in Canada.

## Cleveland Undertakes Many Airplane Activities

CLEVELAND, April 8—There have been numerous airplane activities in this city during the past week. Sites are being selected for landing planes, and these will be used when the government decides to put Cleveland on the airplane postal service map.

The Signal Corps established its airplane headquarters here, largely due to the central location of the city, as it is an easy matter to keep in touch with Buffalo, Detroit and Dayton. At these points, as well as Cleveland, a large amount of the airplane production work is at present concentrated.

The labor situation in Cleveland from an airplane standpoint is satisfactory and according to the Cleveland Board of Commerce there is always a surplus on the weekly list. About 1200 laborers of the semi-skilled class are placed in positions each week by the Cleveland Board of Commerce and there is always an excess of from 300 to 400 who remain unplaced.

In addition to the manufacture of planes, there are nearly 150 manufacturers of automobile trucks, passenger cars and parts in the city of Cleveland, giving a nucleus from which sources of supply for practically all airplane parts can be drawn. A recent canvass of the automobile parts situation resulted in the discovery that every part of an automobile excepting the steering wheel is made in Cleveland.

Activities in the Martin Aircraft plant are also arousing the city's interest.

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### Women Drivers for Government Convoy

LANSING, April 8—Attired in regulation army uniforms, nine young women, members of the National League for Women's Service, left Lansing recently, each driving a ¾-ton Reo truck loaded with government supplies, to Atlanta. For the last 8 months, women have worked in Atlanta and other cities in transporting government and Red Cross supplies.

To demonstrate her proficiency as a driver and mechanic each woman will be held responsible for the conditions of her own truck for the whole distance of 1000 miles.

# Calendar

**ASSOCIATIONS**

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.

May 13-18—Cleveland. War Convention of Machinery, Tool & Supply Industry of the United States.

June 3-4.—Chicago. National Gas Engine Assn. Eleventh Annual. Hotel Sherman.

June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.

June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

**SHOWS**

April 6-13—Green Bay, Wis. Brown County Automobile Trade Assn.

April 6-13—Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory, E. C. Von Kattengell, Mgr.

April 8-13—Reading, Pa., Reading Auto Trade Assn.

April 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

April 16-20—Deadwood, S. D. City Auditorium.

April 17-19—Davis, Cal., Tractor Demonstration. University of California.

April 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

May 3-7—Lima, Ohio, Ohio State Automobile Assn.

Sept. 23-28—Chicago, National Accessory Show for Fords, Coliseum.

**ENGINEERING**

June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.

Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.